The Foundry

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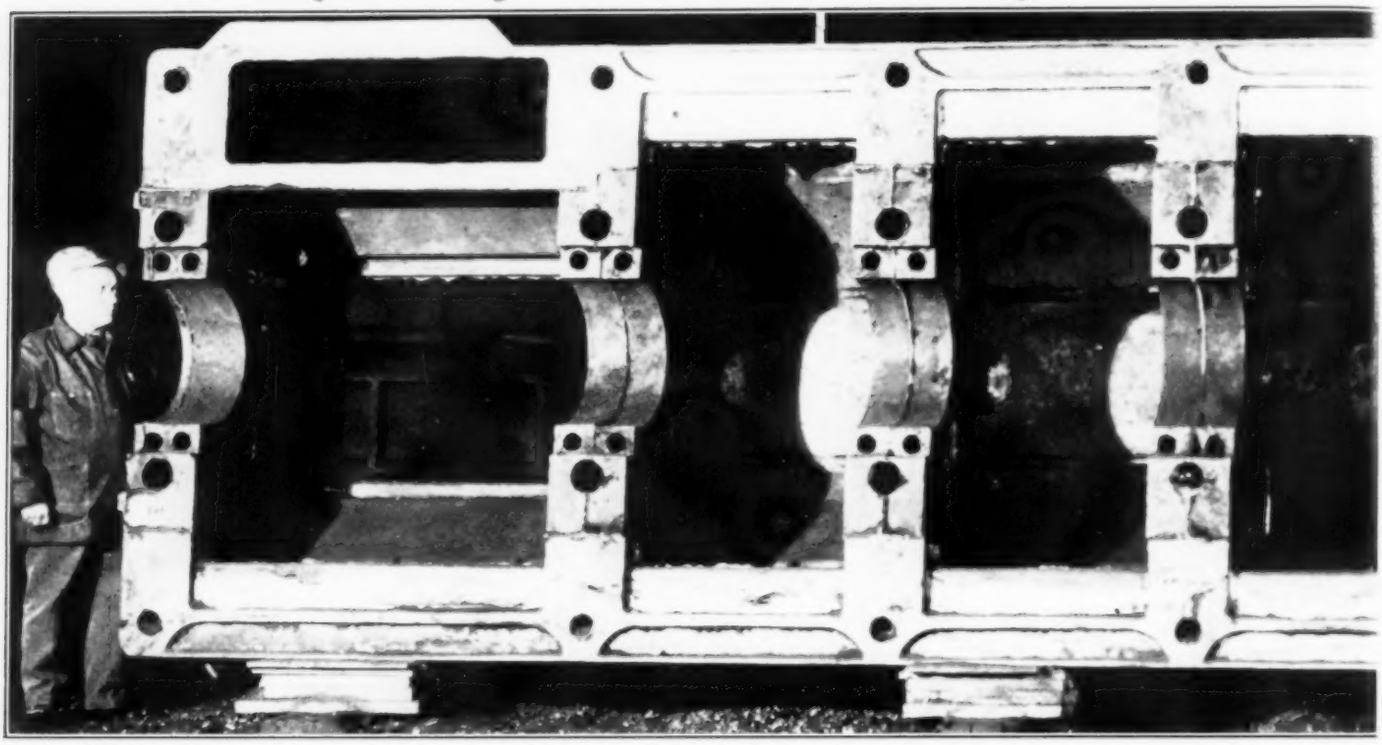
When you pour a lot of metal,



50% *of the cores used in this job are oil cores and the oil is . . .*

LINOIL

39 Feet Long — 7½ Feet Wide — 3¼ Feet Deep and Weight is 36,000 Pounds

Diesel Engine Bedplate made by

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Milwaukee, Wisconsin

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(DIVISION OF ARCHER-

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The Foundry Editorial

Foundry Industry Profits from Convention and Show

FROM every point of view, the recent convention and exhibition of the American Foundrymen's association was one of the most successful foundry meetings ever held in America. In spite of weakness in the general business situation, a condition which undoubtedly prevented many from making the trip to Cleveland, the total attendance for the five days of the show was the largest since the association previously met on the shores of Lake Erie 8 years ago. A final check may show all records broken.

A beautiful foundry show, held in Cleveland's spacious underground exhibition hall, provided visual evidence of the enormous contributions equipment and supply manufacturers have made toward progress in the foundry industry. The fine program of technical meetings reviewed past developments and pointed the way to future progress.

Proper credit for many contributions to success of the annual association meeting is difficult, due to the large number of individuals and groups participating. Nevertheless, special mention should be made of the authors of papers, session chairmen, members of the Northeastern Ohio chapter serving on various convention committees, exhibitors, and the officers and staff of the association. The membership of A. F. A. owes a debt of gratitude to these and many others.

Foundrymen attending the convention and exhibition profited in many ways. Technical papers, the show and other features have provided information on methods and materials. But most important, a spirit of confidence in the future growth of the foundry industry permeated the convention atmosphere. Foundries are preparing for tomorrow when demand for castings may exceed available capacity.

Display Castings at Home

DESPITE remarkable progress of the foundry industry during the past decade in improving both practice and product, great numbers of foundrymen fail to acquaint engineers and purchasers of fabricated materials with the numerous advantages and the high qualities of ferrous and nonferrous castings.

How many foundries begin their selling efforts at the plant by providing a suitable display of castings in the front office of the company? In all likelihood the total number of firms thus advertising their products is exceedingly small. To some castings producers, even the suggestion of the idea would bring forth a series of excuses, extending all the way from lack of sufficient space to a doubt of tangible values in such a display.

Many companies could find plenty of room for a productive display by cleaning out the accumulation of horrible examples in the form of defective castings over which post-mortems already have been held, as well as a wide variety of odds and ends that often clutter up the office. Considering the fact that every person entering the foundry office is either a customer or a prospective customer, the value of an educational exhibit should be apparent.

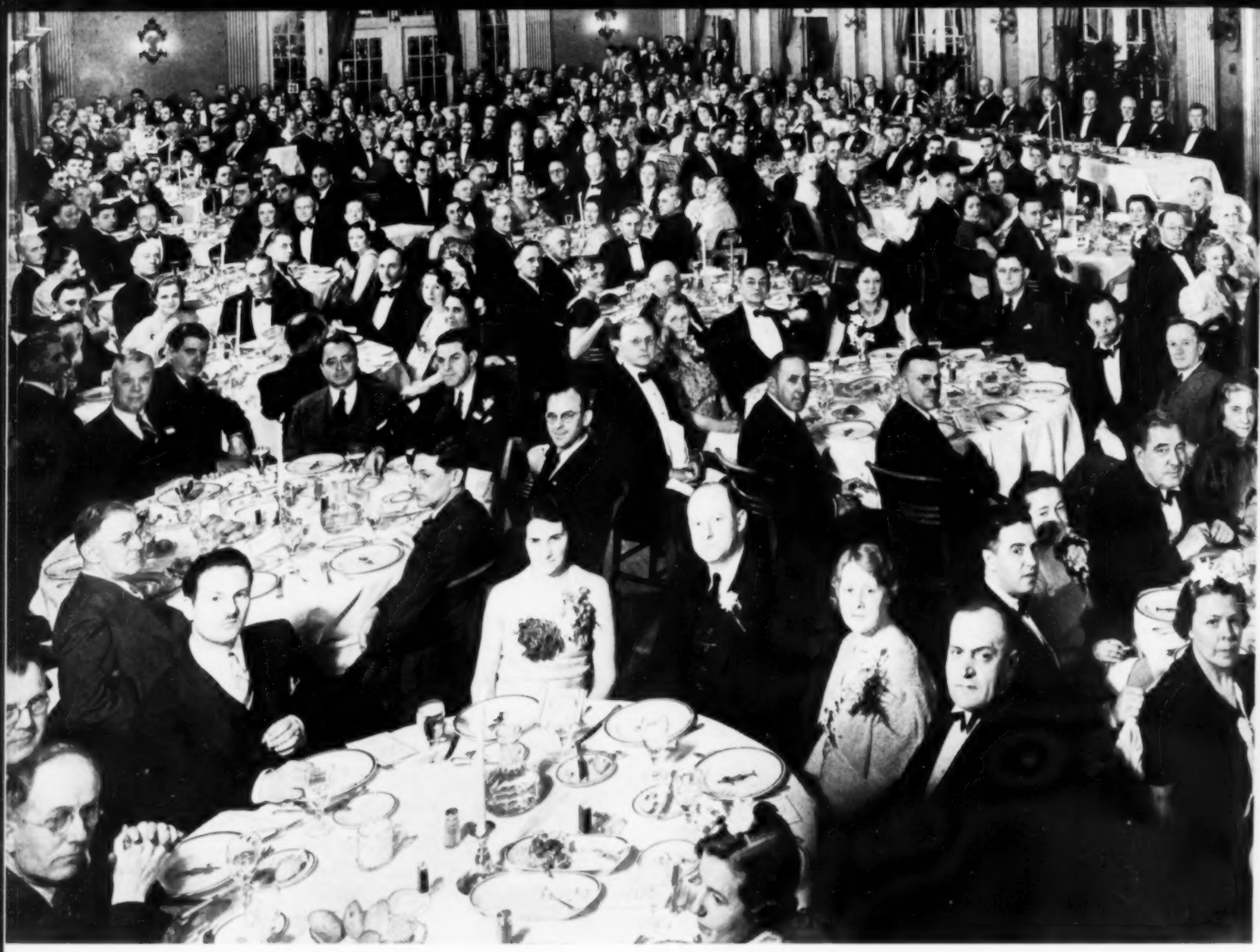
Several equipment vendors have mentioned that more foundries maintain displays in the Chicago district than in any other section. This has come about through the success of castings displays sponsored by the Chicago chapter of the A. F. A. in connection with joint meetings with engineering societies. Plants adopting the plan have found it a valuable part of the advertising program.

The Customers' Needs

REFERRING again to the subject of selling, it would seem that every producer of industrial equipment should find much of value in the suggestion contained in the following paragraph taken from a recent issue of *Steel:*

> This is not a good time for the manufacturer who waits for his customers to get in a spending mood. It is a good time to study customers' operations and show them the money they are out of pocket through inefficient practices. It is a good time to educate industrial management that tension on the purse-strings should not be at the expense of efficient production.

Frank G. Steinebach
Editor



SUPREME confidence in the future possibilities of a healthy and growing industry permeated the annual convention of the American Foundrymen's association held in Cleveland, May 14 to 19. Leaders of the foundry industry, who have discounted the present depressed condition of business, now are looking forward cheerfully and planning for the future when the demand for castings again will exceed available production capacity. The optimism of these men seemed to spread throughout the entire convention.

In excess of 12,000 visitors saw one of the finest industrial shows ever staged, participated in a comprehensive technical program of the highest quality, and enjoyed the many special features of the convention. Quality of the registered attendance was exceptionally high, with hundreds of top ranking executives present to study the latest ideas and developments in machines, materials, equipment and methods for producing castings more efficiently and economically.

The forty-second annual convention of the American Foundrymen's association was opened officially Monday morning, May 16, with Hyman Bornstein, Deere & Co., Moline, Ill., and president of the association, presiding. Bertram G. Parker, Youngstown Foundry & Machine Co., Youngstown, O., and general chairman of the Northeastern Ohio chapter committees, welcomed the members and guests of the association to Cleveland. He also outlined the various entertainment features arranged by the Northeastern Ohio chapter committees.

Official greetings at the meeting were extended by Harold H. Burton, mayor of Cleveland. Among other features he stressed the important part machinery must play in the future of the country and also discussed briefly the need for government, properly organized and administered, wherever industrial competition exists.

Officers Elected for Coming Year

President Bornstein appointed the following committee to select a nominating committee, which in turn will nominate association officers for 1939: Fred J. Walls, International Nickel Co., Detroit, chairman; Harold W. Johnson, Greenlee Foundry Co., Chicago; and R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.

The annual business meeting of the association was held Wednesday morning, May 18, with President Bornstein presiding. Dan M. Avey, secretary-treasurer of the A. F. A. read the report of the nominating committee, and as no further nominations had been received, President Bornstein declared the following officers elected for the 1938-1939 fiscal year:

President, Marshall Post, vice president and general manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; vice president, Henry S. Washburn,

Industry Gains *Confidence* Through A. F. A. Convention

president, Plainville Casting Co., Plainville, Conn.; directors to serve 3 years, Hyman Bornstein, director of research, Deere & Co., Moline, Ill.; Frederick Ayres Lorenz Jr., vice president, American Steel Foundries, Chicago; D. O. Thomas, vice president, Bendix Aviation Corp., South Bend, Ind.; George A. Seyler, works manager, Lunkenheimer Co., Cincinnati; and H. S. Hersey, vice president, C. O. Bartlett & Snow Co., Cleveland.

Upon recommendation of the board of directors, life memberships in the A.F.A. were presented to Hyman Bornstein, past president, and Frederick A. Lorenz, Jr., director-elect and recipient of the Joseph S. Seaman medal for 1938.

Fred J. Walls, chairman of the prenominating committee presented the following names for the nominating committee: Alfred L. Boegehold, General Motors Research division, Detroit; L. H. Rudesill, Griffin Wheel Co., Chicago; Sam Tour, Lucius Pitkin Inc., New York; Walton L. Woody, National Malleable & Steel Castings Co., Sharon, Pa.; with alternates R. R. Deas Jr., American Cast Iron Pipe Co., Birmingham, Ala.; Robert Gregg, Reliance Regulator Co., Los Angeles; William C. Hartman, Bethlehem Steel Co., Bethlehem, Pa., and Joseph Sully, Sully Brass Co., Toronto, Ont.

The following cablegrams were read by Frank G. Steinebach, THE FOUNDRY, Cleveland, and chairman of the International Relations committee of the A.F.A.:

The French Foundrymen's association addresses its cordial greetings to its American colleagues. Best wishes for a successful convention.

President Sandre

Institute of British Foundrymen send cordial greetings to American Foundrymen's association and sincere wishes for a successful convention. Hope to welcome many American friends to the International Foundrymen's congress in London in 1939.

C. W. Bigg, president
Tom Makemson, secretary

Robert E. Kennedy, technical secretary of the as-

Left—Marshall Post. Right—H. S. Washburn

sociation, read the list of prize winners in the pattern-making, gray iron, steel and nonferrous apprenticeship molding contest sponsored by the association. Names of prize winners are presented elsewhere in this issue.

On behalf of the board of awards, Frank J. Lanahan, Ft. Pitt Malleable Co., Pittsburgh, and past president of the association introduced Charles R. Hook, president of the American Rolling Mills Co., Middletown, O., and president of the National Association of Manufacturers, who presented the first of a projected series of annual addresses.

Speaker Presents 7-point Program

Discussing "Some Management Opportunities and Responsibilities." Mr. Hook urged industry to support the following seven point program which, he claimed carries the necessary punch to restore business activity in America as quickly as we can mobilize our support: 1. Constructive steps by government to create confidence in the fundamentals of the private enterprise system; 2. Assurance by the federal government that it will not proceed in competition with private utilities and will refrain from practices which retard public utility expansion by discouraging investment and purchases; 3. Prompt solution of the underlying railroad problem; 4. Avoidance of new federal reform legislation that will result in a fresh period of uncertainty at a time when the nation should be concentrating upon making jobs; 5. Co-operation between all groups to increase the national income; 6. Adequate definition of specific purpose in appropriating further national funds for relief purposes, with relief funds administered by experienced local agencies to prevent malingering and waste of taxpayers' money; and 7. Revision of the Wagner act to make it a workable instrument for curtailing labor disputes.

Over 40 officers, representing all chapters of the association, discussed numerous chapter activities at a luncheon meeting Monday noon, with Marshall Post, president-elect of the association, presiding. President Bornstein stressed importance of the chapter movement in development of the national association. He also complimented chapter officers on the work which has been done during the year.

Topics discussed included financing problems, work of executive boards, activities of program committees, methods of handling meetings, special activities, regional meetings, lecture courses, vocational training, apprentice activities, and a number of other problems.

Annual dinner of the association, Wednesday evening in the ballroom of the Hotel Cleveland, was one of the most colorful in the history of the A.F.A. Hyman Bornstein, retiring president of the association, presided.

On behalf of the board of awards, James L. Wick Jr., junior past president of the A.F.A., presented the Joseph S. Seaman gold medal to Frederick Ayres Lorenz Jr., vice president, American Steel Foundries, Chicago. Due to illness, Mr. Lorenz was unable to attend the meeting and the medal was accepted in his behalf by Alfred Walcher, vice president of the American Steel Foundries.

The principal address was presented by H. V. Kaltenborn, noted radio commentator. Highlight of his address was the prediction that business would improve in the fall and that the next meeting of the association would be held under far better economic circumstances. The banquet was followed by a reception and dance under the auspices of the Northeastern Ohio Chapter of the A.F.A.

Large Crowd at Stag Party

A new record of attendance at the stag dinner was established Tuesday night when 2300 foundrymen streamed into the music hall of the public auditorium to witness a vaudeville show, and later filled the main floor of the auditorium where long tables were set with refreshments. The affair was sponsored jointly by the American Foundrymen's association, the Foundry Equipment Manufacturer's association and the Northeastern Ohio chapter of the American Foundrymen's association.

Interesting discussion of problems pertaining to engineering education and the foundry field featured the engineering and shop practice instructors' dinner held Monday evening, May 16 at Hotel Statler, with Frank G. Steinebach, THE FOUNDRY, as chairman. Robert E. Kennedy, technical secretary of the association, reviewed the history of the instructors' dinner and pointed to the better understanding which has developed through discussion of common problems. Marshall Post, president-elect of the A.F.A. paid tribute to the work of engineering instructors, and mentioned briefly the French school which confers the degree of foundry engineer.

Frederick G. Sefing, International Nickel Co., Bayonne, N. J., and former professor at Michigan State college, East Lansing, Mich., presented a paper "What a Course in Metallurgy Should Teach." Mr. Sefing

pointed out that many experiences in science, in the art of living with people, and in technology must be had if one is to become a finished metallurgical engineer. The young man in college is learning to live with other people. New ideas in the arts and sciences are assimilated rapidly for 4 years. The student does not learn until the senior year how to assimilate all these ideas so that he can put them to work in his chosen profession. Experiences in college are largely fictitious, while those in industry are real. According to the speaker, industry must assume the responsibility of making the necessary adjustment to the world of reality.

Carl H. Casberg, professor of mechanical engineering, University of Illinois, Urbana, Ill., in discussing "How Can a Foundry Course in an Engineering School Meet the Highest Requirements of an Engineering Curriculum?" pointed out that the foundry course in an engineering college should be designed to give the engineering student the knowledge that will be of most benefit to himself and to his employers. Since the greatest percentage of engineering graduates, civil engineering excepted, go into manufacturing, a knowledge of the use, design, production, metallurgy, physical properties of ferrous and nonferrous castings, and the methods used to produce them, would be of greatest use to engineering graduates. Prof. Casberg outlined various means of instructing students in the use, design and production of various types of castings.

Present Opposing View Points

The discussion disclosed that quite often industry feels the engineering school is not producing the type of graduate fitted for its particular needs, while the engineering college contends that industry is not willing to employ and train further the men which are graduated. The statement was made that in the past the foundry industry has not been aggressive in securing technical graduates, but the trend now is changing and the future probably will find more and more technically trained men occupying key positions in plants producing castings. It was felt that joint meetings for instructors and leaders in the industry could do much to provide a better understanding and a common point of view.

One meeting of extreme interest to the foundry industry in general was that on foundry safety and hygiene which was held Thursday afternoon under the direction of E. H. Ballard, General Electric Co., West Lynn, Mass. Dr. Leonard Greenburg, executive director, division of industrial hygiene, department of labor, State of New York, presented an interesting talk on silicosis and the foundry industry. Dr. Greenburg said that a recently completed survey conducted in foundries of New York state involving over 4500 employes in approximately one-third of the foundries, and which constituted a comparable cross section of all types and sizes of foundries, showed that only 2.4 per cent of employes in all classifications exhibited silicosis. For those directly concerned with foundry operations, the rate was 2.7 per cent.

Of foundry workers alone 4.5 per cent showed indications of fibrosis with and without silicosis. Dr. Greenburg pointed out that the degree of fibrosis and silicosis will depend on the length of exposure to dust, and that in the survey 2.2 per cent of foundry workers exhibited first stage silicosis; 0.4 per cent, second stage, and 0.1 per cent showed third stage silicosis. He stated that the statistics obtained indicated that there was little difference in figures obtained from different branches of foundries.

Foundries Show No Serious Hazard

Dr. Greenburg said that the survey clearly indicated that the foundries showed no serious hazard as far as dust exposure was concerned, and what little hazard there was could be cured by a simple straight forward attack. The paper was discussed by Dr. J. H. Chivers, Crane Co., Chicago, who stated that the data presented confirmed similar information he had compiled. He said that the comparatively small dust hazard existing in individual foundries could be remedied by attention to four factors of which the first was to obtain an occupational record of all workers since their beginning of work; second, adequate medical examination; third, have X-ray photographs taken according to acceptable principles, and fourth, conduct a careful engineering survey of working conditions.

W. J. Grede, Liberty Foundry Co., Wauwatosa, Wis., asked if there was any relation between age groups and exposure in foundries to that of general population. It was stated that in all cases there was a close parallel. Dr. White, Chicago, presented some figures which agreed closely to those of Dr. Greenburg. He found the percentage for fibrosis to be 5.4 per cent, and for silicosis, 1.8 per cent as compared to 4.5 per cent and 2.4 per cent respectively in Dr. Greenburg's report.

Dr. White said that he believed workers who continually were subject to (*Please turn to page* 76)

Progress

Keynote of Sp

INDUSTRIAL America, represented by thousands of men who control policies and operations in their respective plants, was privileged to inspect one of the best laid out, one of the largest and one of the most successful shows at Cleveland, May 14-19. Never before in the history of the foundry industry has the interpretation of the artist been combined so skillfully with the developments of the engineer, designer, metallurgist and mechanic to present the best current practice and future trends in the foundry field. Progress in machines, materials and supplies, and therefore, progress in methods of manufacturing castings, was portrayed among colorful, artistic and beautiful surroundings.

While a number of new developments in equipment and supplies were shown for the first time at this exhibition, visitors apparently were equally interested in everything on display. Conversations at the close of the show revealed some equipment was sold, many substantial prospects were developed, and an indication of considerable fall buying was uncovered. Exhibitors were pleased with a record crowd, and an exceptionally high attendance of plant executives.

Ever increasing employment of cleaning and dust removal equipment was depicted in exceptionally large and beautiful displays by numerous firms. American Air Filter Co. Inc., Louisville, Ky., had a wet type dust collector in operation, photographs of various equipment installations and a working model to show an air curtain dust removal device. American Foundry Equipment Co., Mishawaka, Inc., displayed in operation two centrifugal type abrasive blasting tables, two sand cutting and mixing machines, a bag type dust collector, two barrel type centrifugal abrasive blast machines, and snap flasks and jackets.

f Splendid Show

Hydro-Blast Corp., Chicago, had for the background of its booth, two enlarged photographs showing wet blasting equipment in operation. Kirk & Blum Mfg. Co., Cincinnati, displayed specimens of sheet metal piping, and called attention to the large installation of piping at the Pangborn Corp. exhibit. Pangborn Corp., Hagerstown, Md., exhibited over seven carloads of equipment in operation. This included three table type, centrifugal abrasive blast machines, three barrel type, centrifugal abrasive blast machines, a dust collector, and an electrically operated dust precipitator. Parsons Engineering Corp., Cleveland, displayed bag type and wet type dust collectors, sandblast equipment, a new electric lift truck, and barrel dumping device.

Claude B. Schneible Co., Chicago, had a wet type dust collector in operation, and also showed a multi-louver dewaterer, and numerous photographs and diagrams of installations. W. W. Sly Mfg. Co., Cleveland, exhibited a tumbling mill, pressure abrasive blast cleaning equipment, wet type dust collector, bag type dust collector, safety air helmet, and a new centrifugal type, abrasive blast cleaning unit with a continuous feed and discharge. U. S. Hoffman Machinery Corp., New York, operated large and small vacuum cleaning units for industrial applications.

Grinding wheels and other abrasive materials play an important part in foundry production, as indicated in exhibits by five companies. Abrasive Co., Philadelphia, stressed a recent development in high speed snagging wheels, the use of steel flanges around the bore claimed to have a number of advantages. Carborundum Co., Niagara Falls, N. Y., displayed grinding wheels of various types, castings which had been ground with its wheels, and silicon carbide refractory materials.

Macklin Co., Jackson, Mich., had an attractive exhibit of grinding wheels centered around a model foundry scene showing a miniature figure operating a swing frame snagger. Norton Co., Worcester, Mass., had a canopy over its booth in the form of a grinding wheel about 15 feet in diameter. In the booth were shown a line of abrasive products. Sterling Grinding Wheel Co., Tiffin, O., displayed grinding wheels and other abrasive products. In addition a rifle range with an electrically operated gun was in operation for entertainment of

visitors who might be interested in the sport.

Metallic abrasives were shown by several firms. Globe Steel Abrasive Co., Mansfield, O., displayed samples of abrasive in various sizes, castings cleaned by the abrasive, and photographs of abrasive cleaning equipment. Pittsburgh Crushed Steel Co., Pittsburgh, exhibited castings cleaned with abrasives, photographs of cleaning installations, and abrasive. Steelblast Abrasives Co., Cleveland, employed an immense burlap bag as a background for a traveling belt displaying metallic abrasives, and two machines for testing the material. Steel Shot & Grit Co., Boston, showed photographs of installations of abrasive cleaning equipment, samples of abrasive, and cleaned castings.

Black & Decker Mfg. Co., Towson, Md., demonstrated the use of portable electric sanders on a steel plate. Other portable and stationary grinders and drills were shown.

Illustrations of use of a pneumatic rammer with a blank head attracted visitors to Dayton Pneumatic Tool Co.'s exhibit, where nail drivers, chippers, riveters and other equipment were on display. The head of a model wearing a dust mask at the booth of Martindale Electric Co., Cleveland, showed how proper protection is obtained. New flexible shaft equipment, rotary files and burs, also were shown at this company's booth.

United States Electrical Tool Co., Cincinnati, featured a new electric motor-driven grinder with instantaneous speed change, and a newly-designed swing frame snagging machine, also portable electric tools. Air for other exhibitors was supplied by Schramm Inc., West Chester, Pa. Two air compressors, 300 and 120 cubic foot displacement, respectively, were in continuous operation.

The molding machine section presented as wide, if not actually a wider variety of machines than ever before displayed at a foundry exhibition. Practically every machine showed refinement or improvement over models shown in former years while in some instances the machines were entirely new creations, shown for the first time.

Show Wide Variety of Molding Machines

Taking them in alphabetical order for convenience in presentation the Arcade Mfg. Co., Freeport, Ill., showed three types of portable molding machines, a jolt squeezer, jolt squeezer stripper and jolt squeezer pattern draw. These machines are equipped with roller bearings.

Beardsley & Piper Co., Chicago, had an elaborate display of molding and sand handling equipment including a sand muller, a sand aerator and a new type sandslinger which carries all the usual features, sand handling, articulated swinging arm and impellor which engages the stream of sand and drives it into the mold.

However, an entirely new feature is incorporated in the new model. A single operator sits on top of the machine and directs all operations of the machine through push button control. At the demonstration an operator seated at a table in the vicinity of the machine exercised remote control through a chart on the table and a small lever. A small nozzle was attached to the arm of the machine and the nicety of control was illustrated by depositing a small stream of sand on the floor to form any combination of letters.

Install Safety Feature on Machine

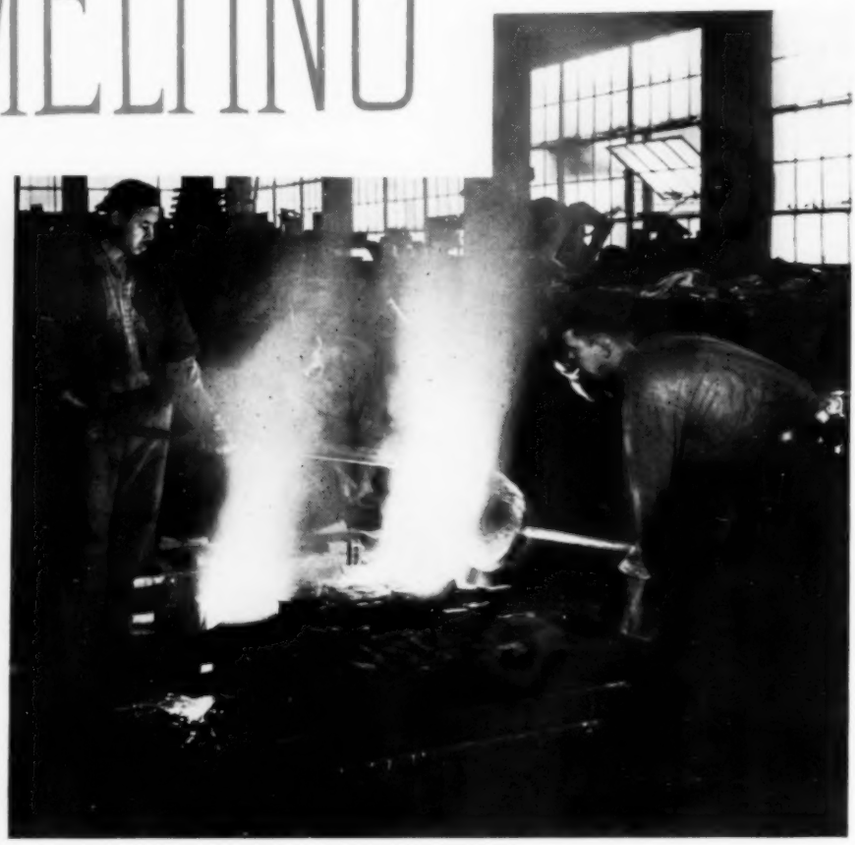
To meet the demand for greater safety in the foundry the Champion Foundry & Machine Co., Chicago, has equipped swinging squeeze heads on molding machines with an automatic device which prevents the machine from functioning unless held in certain positions. The operator has to hold the head definitely in position with one hand while he manipulates the valve with the other hand. Another safety principle is incorporated in machines made by the Wm. H. Nicholls Co., Inc., Richmond Hill, Long Island, N. Y. In this instance the movement of the operating valve is controlled by an electrical contact. The operator has to use both thumbs to press two buttons simultaneously. In this manner his hands are removed from a potential danger zone.

Core blowing machines in three different sizes were shown at the booth of Wm. Demmler & Bros., Kewanee, Ill. Foundrymen are familiar with the operation of this type of core making machine where sand under air pressure is forced into a corebox. An auxiliary piece of equipment was a quick acting clamping device in which special and intricate cores may be rolled over and accurately drawn from the corebox.

Grimes Molding Machine Sales, Detroit, showed two molding machines, one a hand rammed rollover and the other a jolt ram rollover. In addition the company in connection with the Baker Perkins Co., Saginaw, Mich., had on display a new type motorized weigh larry with photoelectric cells arranged to operate from scale beam and control feed to weigh hopper. A double chamber sand mixer equipped with revolving paddles similar to those in a dough mixer, was shown under a hopper mounted on a carriage designed for use with a single mixer or with a battery.

Herman Pneumatic Machine Co., Pittsburgh, displayed a portable jolt squeeze machine with 18 x 24-inch table equipped with a special locking device which holds the head definitely in position. Two other machines also were shown, one a rollover jolt machine with table 20 x 30 inches and the other with table 30 x 48 inches. A larger jolt rollover machine with a 20-inch diameter cylinder and table 60 x 80 inches had a lifting capacity of 6 tons. (*Please turn to page* 94)

MELTING Nonferrous Metals



Proper Operation, Care and Maintenance of Furnaces Employed for Melting Are Important Features and Require Constant Vigilance To Insure That the Metal Will Be Free from Any Possible Gassing and from Contamination

By N. K. B. PATCH

THE reverberatory or barrel type of melting furnace used commonly in brass and bronze foundries is essentially a cylinder lined with refractory, with an opening at some point through which the cold metal is charged and from which the molten metal is poured, and an opening at the end through which the burner injects a flame. These furnaces are designed to use oil or gas as fuel and some of them have a burner at one end and others have burners at both ends.

There is one type in which the burner is located at one end and the spent gases pass out the other. The furnace is designed so as to enable the operator to keep the furnace continually rotating during the melting cycle and when the melting has been completed the furnace is tilted to pour the molten metal through an orifice at the end opposite the burner location.

Capacities range from 150 pounds of brass per charge to 3000 pounds per charge. The burner is arranged so as to permit swinging aside during the charging period and a door at the burner end is swung open to make a larger opening through which the charge may be put into the furnace. The furnace, as shown in Fig. 2 is on trunnions so that it may be tilted in any desired position particularly for charging. It frequently is found desirable to operate the furnace in a slightly tilted position to improve its melting conditions for a given type of charge, and that is found by experimenting.

Operation of this furnace is to preheat, open the charging door and insert the charge of metal. Then after closing the charging door and returning the burner to its operating position, heat is turned on. As soon as the metal has had a chance to warm up, the furnace is rotated so that the metal is turned over on what was the hot roof of the furnace. That procedure is followed at intervals until some of the metal, if borings or turnings are present, has begun to melt. Then if the charge is such that it does not damage the refractory lining by falling upon it, it will be found desirable to allow the rotation to continue slowly so that all the metal may get an even distribution of the incoming heat.

Furnace Should Be Rotated Slowly

If, however, the charge is made up of large heavy chunks, it will be preferable to rotate the furnace only periodically until there is sufficient molten metal to absorb the shock of these pieces as they move around the furnace. It is essential, from the standpoint of efficiency, to utilize the rotative capacity of the furnace as much as possible to permit the heat absorbed by the refractories to be transferred to the metal.

Continuous spreading of the metal over the refractory lining tends to keep the temperature of the lining more uniform throughout its area. If no mechanical damage is done to the lining, (*Please turn to page* 108)

A.F.A. Medal Awarded to F. A. Lorenz Jr.

Frederick Ayres Lorenz Jr.

THE Joseph S. Seaman gold medal of the American Foundrymen's association was awarded to Frederick Ayres Lorenz Jr., vice president, American Steel Foundries, Chicago, at the annual banquet of the association at Hotel Cleveland, May 18. The award was made upon recommendation of the board of awards to the board of directors, and honors Mr. Lorenz for his leadership and accomplishments in the management and commercial phases of casting manufacture, and his service to the foundry industry as a whole. Due to illness, Mr. Lorenz was unable to be present, and the award and gold medal were accepted in his behalf by Alfred Walcher, vice president, American Steel Foundries, Chicago.

Active in Operating Department

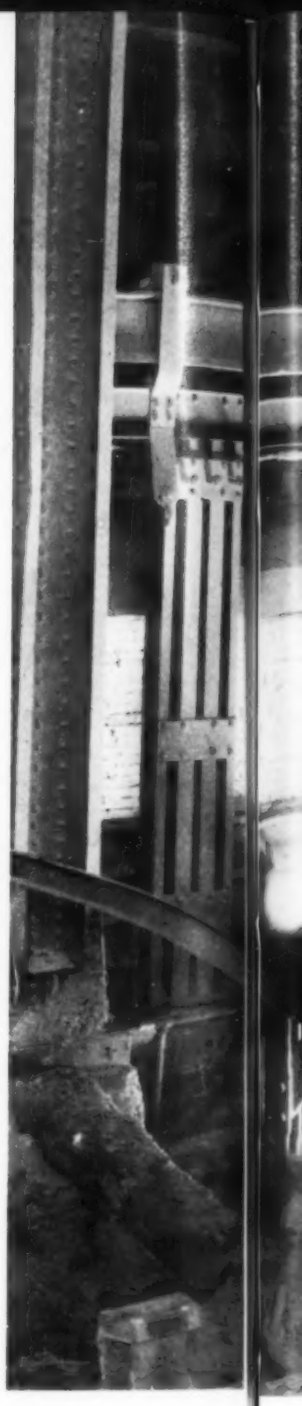
Frederick Ayres Lorenz Jr. was born in Lansing, Mich., Feb. 26, 1886. He attended the University of Chicago in 1904 and 1905, and was graduated from the University of Illinois, Urbana, Ill., in 1909 with a bachelor of science degree in mechanical engineering. Following graduation he began his business and professional career with the Chicago & Northwestern Railway Co., Chicago, as inspection engineer. He then became plant engineer and later superintendent of the rolling mill, East Chicago plant, Republic Iron and Steel Co. In 1911 he became connected with the American Steel Foundries, where he advanced through various positions in that organization until he was made a vice president.

In addition to his management responsibilities, Mr. Lorenz has been active in the operating department. He has contributed of his experience to the technical literature of the industry and has presented papers before the American Foundrymen's association. He also prepared the section on steel casting design which was included in the *Symposium on Steel Castings* published jointly by the American Foundrymen's association and the American Society for Testing Materials. His most recent contribution is the paper, "Engineering Approach to the Use of Steel Castings," which was presented at the foundry metals session of the machine shop practice division, American Society of Mechanical Engineers, held recently in Rochester, N. Y.

His activities have extended into many fields. Mr. Lorenz is a member and chairman of the executive committee, Steel division, American Foundrymen's association; Lieut. Col. in the Ordnance Reserve, United States army; and director of the American Management association. He served as a member of the Durable Goods Industries committee in 1934; a director of the Chicago post, Army Ordnance association in 1934; and president of the Midwest Marketing society in 1934.

For the past 5 years, Mr. Lorenz has been president of the Steel Founders' Society of America. During his administration the society has grown until it now almost completely covers the entire steel castings field.

Steel Foundry Practice Requires Planning



This article is abstracted from a paper presented by the author at the Cornell Regional Foundry conference sponsored jointly by the Buffalo chapter of the A.F.A., foundrymen of Northwestern New York, Cornell university, and the American Foundrymen's association, and held at Cornell university, Ithaca, N. Y.

By W. J. Corbett

Works Manager,
Atlas Steel Casting Co.
Buffalo

AFTER designs are established and before proceeding with the manufacture of steel castings, careful planning is necessary if the pitfalls incident to haphazard foundry methods are to be avoided. Much of the required preliminary work deals with the following: Patterns, feeding and pouring, coremaking practice, molding practice, and effect of the preceding on cleaning and finishing operations. Frequently, it involves suggested changes in design of the casting to permit giving the customer a more satisfactory article, or to prevent giving him something which does not meet his requirements.

First requisite in making a satisfactory steel casting is suitable pattern equipment. The pattern should be made in accordance with the directions received from the foundry. Sometimes the foundry is expected to use an old casting for a pattern. Fortunately, this is not the general practice. If it were, foundrymen would have only themselves to blame.

Sweep patterns and coreboxes sometimes are used, but here again only in those cases where the saving in pattern cost is considerably greater than the increased cost of using the sweep for making the mold. A lesser degree of accuracy in dimensions of the casting results from the use of the two types of patterns mentioned.

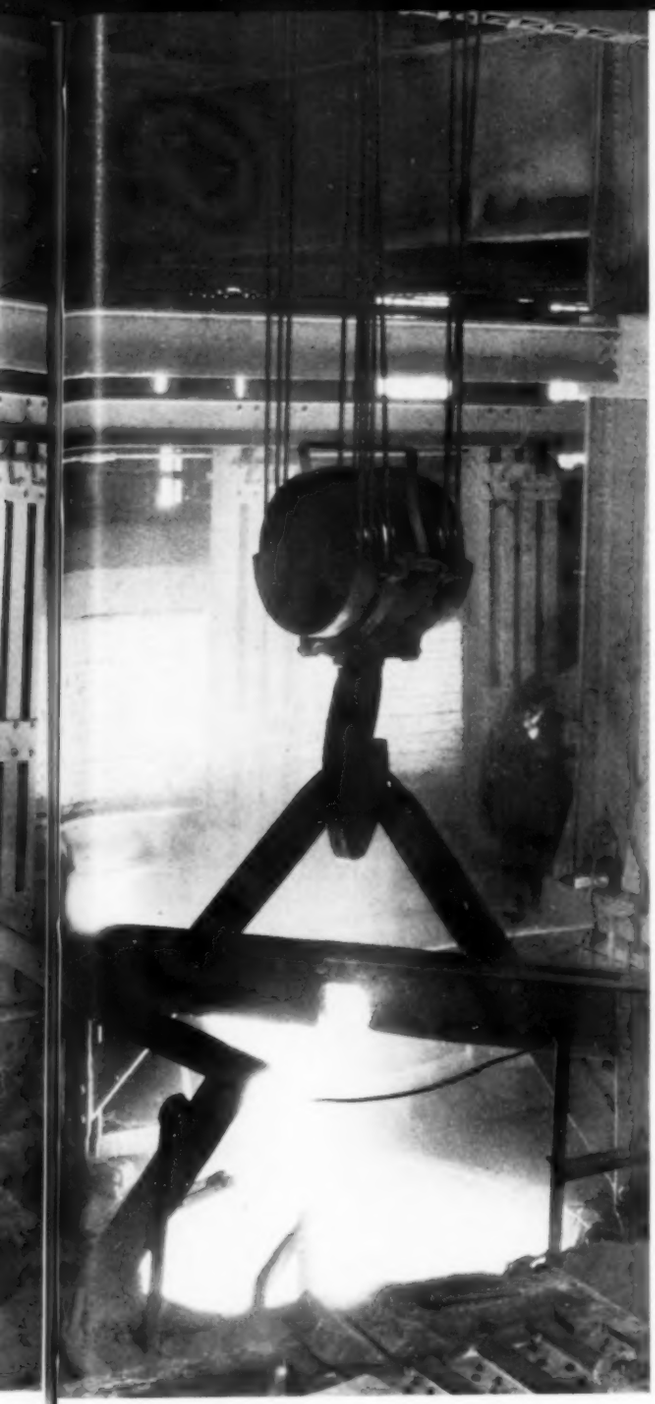
It is becoming more desirable to use cores in parts of patterns which many years ago were made so the pattern formed the core in the mold. The latter causes the pattern to be flimsy and usually retards production of molds. It also is desirable to abolish the use of stock cores whenever possible, especially when such cores are placed in molds in a vertical position making it difficult to insure a close fit in the tapered cope coreprints.

The planning group in a foundry usually determines when it is economical to mount patterns on boards or plates for machine molding. Quantity of castings ordered, probability of repeat orders for castings from the pattern, difference in molding cost between hand molding and machine molding compared with the cost of rigging the pattern for machine molding, more rapid production on machines, use of less skilled molders on machines, and possibility of consistently making castings more true to pattern on machines are given consideration.

Mounting of patterns for machine molding is advantageous whenever the number of castings, justifies the procedure, because there is more likelihood of the details of molding being the same for every order of castings from the pattern. Heads, gates, brackets and chills are fixed in size and location, and consequently these important details are not likely to be varied for different orders.

Many patterns still are made in pattern shops not affiliated with steel foundries, and which do not provide allowances for variation in shrinkage of steel. The common practice for the average patternmaker is to use a 3/16-inch per foot shrink rule for constructing all patterns if he thinks they are to be used for dry sand molds, and ¼-inch per foot shrink rule when used for green sand molds. In most cases these shrink rules are all right.

However, the steel foundryman, when checking the pattern equipment previous to molding, frequently finds that it is safer to have certain dimensions on a pattern or corebox made to allow for ⅛-inch shrinkage per foot, or even with no shrinkage allowance. For example, in



the case of circular castings hollow in the center, such as a ring gear or even a spur gear, the safe procedure would be to allow ⅛-inch per foot shrinkage for the inside diameter of the rim and 3/16-inch per foot for the outside diameter.

This insures the rim being the required thickness after machining the outside diameter. Castings made at different times and by different molders do not always shrink precisely the same. Therefore, the foundryman must determine the safe shrinkage allowance from past experience so that he may obtain castings which will conform with drawing dimensions. The larger the casting, the more important is the determination of the proper allowance on the pattern for shrinkage of steel.

Because different parts of one casting do not always shrink the same amount per foot, the steel foundryman sometimes must allow extra stock on a pattern to insure maintenance of metal thicknesses specified on drawings. The average pattern shop unfamiliar with steel foundry practice does not always make these desired allowances when constructing pattern equipment. A specific example to illustrate this point is a valve body. Most users insist that the flange thicknesses shown on their drawings be maintained after machining the faces of the flanges. Hence it usually is desirable for the foundry to measure the distances between the backs of the flanges on the pattern.

If these measurements made with a 3/16-inch per foot shrink rule conform with the dimensions on the drawing, the flanges are likely to be too thin after machining because the casting may not shrink 3/16-inch per foot. Therefore, it usually is desirable to add extra stock on the backs of the flanges on the pattern to avoid making castings not acceptable to a customer, in spite of the general custom in the industry of the foundry being responsible only to the extent of the casting being like the pattern supplied by a customer. The valve body is just one of many cases where these precautions must be taken to insure proper thickness of certain sections of a casting.

Make Allowances for Mold Wash

When wall thicknesses of a steel casting must be no less than those specified on a drawing, the pattern equipment, especially that for large and medium castings, should be constructed with an allowance for mold wash and core wash. Patternmakers usually make wall thicknesses in accordance with the drawing. Consequently, the metal sections of the casting may be less than those specified due to the mold and core wash. An allowance of as much as 1/16-inch for this on the pattern equipment is not too great, where metal thicknesses on a drawing are to be the minimum thicknesses of the section of the casting. Size and design of the casting govern the amount of the allowance on pattern equipment.

Generally accepted practice in regard to allowance for finish is to add ¼-inch extra stock on a pattern or corebox at surfaces to be machined. Sometimes ⅛-inch or even less allowance is satisfactory. On the other hand there are many instances where ⅜-inch and more is necessary. Most foundries probably prefer to have more allowance for machining on the cope side of a pattern than on the drag side, because there is more likelihood of surface imperfections on the cope side of a casting.

Particles of sand and mold wash sometimes fall from the cope or walls of a mold and float on the surface of the molten steel while the mold is being poured, and appear on the cope surface of the casting. If these particles of mold material happen to lodge on a surface to be machined, they usually will disappear during machining if there has been a sufficient amount of extra stock provided for that purpose on the pattern at these points.

It is not uncommon to allow more than ¼-inch for machining stock at certain parts of a casting which may become slightly distorted while shrinking and contracting in the mold after being poured. In those cases, the extra machining allowance compensates for slight dimensional irregularities difficult to correct by attempting to straighten the (*Please turn to page* 110)

Fig. 1—A view of the material yard showing the wide variety of material employed in making up the metal charges for the cupola. Note the cast iron briquets at the left

This is the first of two articles abstracted from a paper presented by the author at the recent Sixth Annual Joint Foundry Practice meeting held in Birmingham, Ala. The concluding article will appear in the July issue

Practices Cupola

THE foundry of the Caterpillar Tractor Co., Peoria, Ill., might be termed the youngster of the industry, as it possibly is one of the largest foundries built in the last decade. A great deal of thought has been put into up-to-date equipment to meet the various classes of work and the constant change and improvement that is going on in the tractor industry, without causing the foundry to be rebuilt every time a major change is made.

Approximately 3500 different patterns are subject to be called upon to have castings made from them. Weights of castings vary from ounces to approximately 3000 pounds. One readily can see that control of the material placed in these castings is something that cannot be ignored.

Some ten different specifications of cast iron are called upon for different types of castings, and these different specifications are made from two base irons. The changes are made by ladle additions of various alloys. Each iron specification conforms to physical requirements before it is accepted for tractor, road machinery and engineering use.

Some of the cupola material is available within the plant. A certain amount is not altogether desirable. A foundryman would not go into the open market and purchase it. Nevertheless it has redeeming features. One is that it contains a great deal of alloys desirable in castings. The Caterpillar Tractor Co. purchases thousands of tons of high grade alloy steels for various tractor parts. Bearing in mind the material that we

CUPOLA CHARGING REPORT

CUPOLA NO.	HEAT NO.	SHEET NO.	NO. OF SHEETS	DATE
3	566	1	1	6-9-37

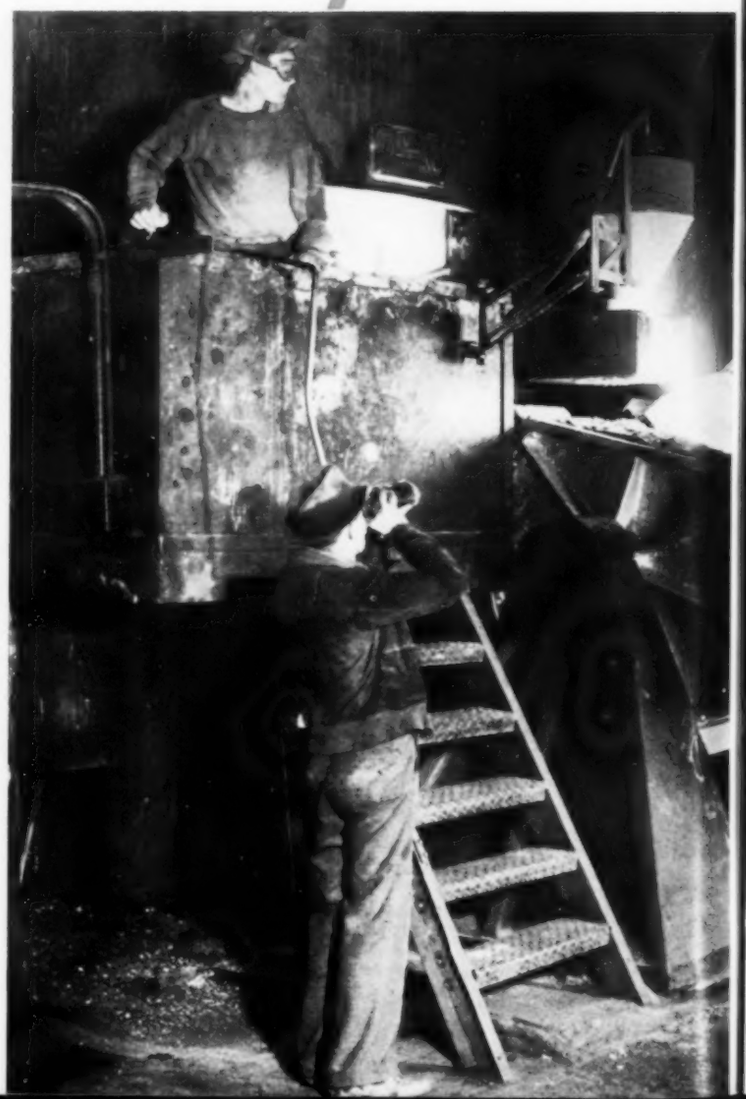
CHARGE NO.	PIG IRON #			SCRAP IRON #	SCRAP STEEL #	FERRO MANG	FERRO SILICON	FERRO CHROME #	NICKEL	COKE #	LIME STONE #
TOTAL FORWARD	232	232	233	300	750					400	90
	Cast Iron Borings			400	1200					400	
				1400	Scrap					300	
				Scrap		4# to 2# machine wt.				6300	
	232 to machine	Slitt								750	
						2# to 6 machine wt.					
	1250	1250		6000	12500			75		750	1410
										4700	750
	1250	1250		6000	12500			75		16450	4660
				SUMMARY				Less reclaiming of coke		2350	

TOTAL MELT 100,000 # — LBS — GATES - SPRUES — OVERIRON — BOTTOMS, ETC. — LBS

REMARKS: 4750# Big Bed

SIGNED

Fig. 2—Cupola charging report representative of 26 consecutive days. Fig. 3 (Right)—Optical temperature readings are taken every 15 minutes



By M. J GREGORY
Factory Manager,
Caterpillar Tractor Co., Peoria, Ill.

Close Control

have to use, mechanical cupola charging is necessary. It would be practically impossible to handle this material by hand.

Fig. 1 shows the material yard, where some of the material gathered from around the plant is used in making high grade iron. A large pile of cast iron briquets is shown in the foreground, also a large pile of miscellaneous steel, some pig iron and in the distance a carload of purchased automotive scrap. This would be rather awkward to handle by hand.

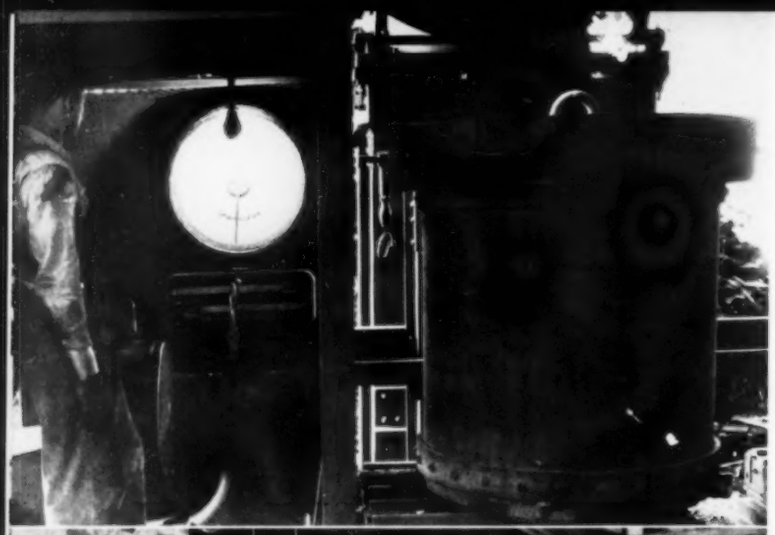
The old saying, "There's gold in them thar hills," readily can be applied to this particular material yard. A great deal of value in the form of alloys is in this material, which goes to make good castings when the base iron is right. Addition of alloys will not improve the quality of cast iron unless the base iron itself is good.

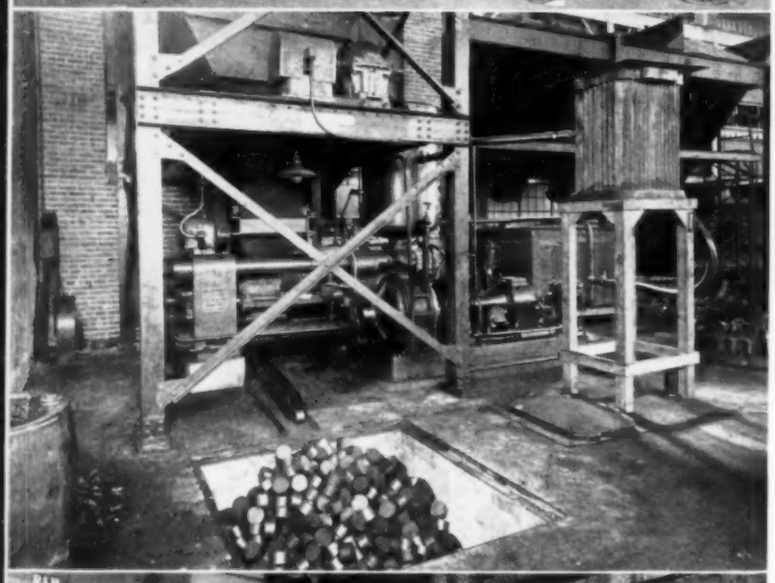
Fig. 2 shows a cupola charging report representative of 26 consecutive days, when the mixture consisted of 15

Calculation of Metal Loss

1932 Date	Charges in Tons	Pounds Charged Second Weighing	Pounds Obtained	Melting Loss	Per Cent of Melting Loss
5-16	57	114,150	108,644	5,506	4.8
5-17	51	102,685	99,125	3,560	3.46
5-18	48	97,321	91,937	5,384	5.5
5-19	48	97,130	93,044	4,086	4.2
5-23	42	85,370	81,212	4,158	4.8
5-24	41	82,621	79,388	3,232	3.9
5-25	41	82,780	78,428	4,352	5.2
5-26	39	79,525	76,940	2,585	3.2
5-31	39	78,995	75,024	3,971	5.02
6-1	45	91,685	87,930	3,755	4.09
6-2	40	81,660	77,580	4,080	5.00
6-6	50	102,695	96,804	5,891	5.7
6-7	50	101,240	97,112	4,128	4.07
6-8	48	98,635	94,476	4,159	4.2
6-9	50	102,710	98,394	4,316	4.2
6-13	45	91,355	86,960	4,395	4.8
6-14	42	85,500	81,490	4,010	4.69
6-15	42	87,065	81,430	5,635	6.4
6-16	42	85,380	80,700	4,680	5.4
6-20	40	80,435	76,346	4,089	5.08
6-21	40	81,590	77,940	3,650	4.47
6-22	50	100,665	95,438	5,227	5.1
6-23	42	84,755	79,862	4,893	5.7
6-27	30	61,220	58,218	3,002	4.9
6-28	32	64,630	62,064	2,566	3.9
6-29	26	52,455	50,536	1,919	3.6
26 Days					(4.66)

Fig. 4 (Above)—Table giving complete report on metal loss for 26 day's run. Fig. 5 (Below)—Scrap from the pile is picked up by a magnet and dropped into the weighing bucket. Note the location of the scale dial opposite the crane operator's cab





per cent cast iron borings, 12½ per cent steel, 50 per cent scrap iron, and 22½ per cent pig iron. This can be summed up by saying that the charge consisted of 77½ per cent scrap and 22½ per cent pig iron. Cupola control required in reducing this material into good iron has to be about right.

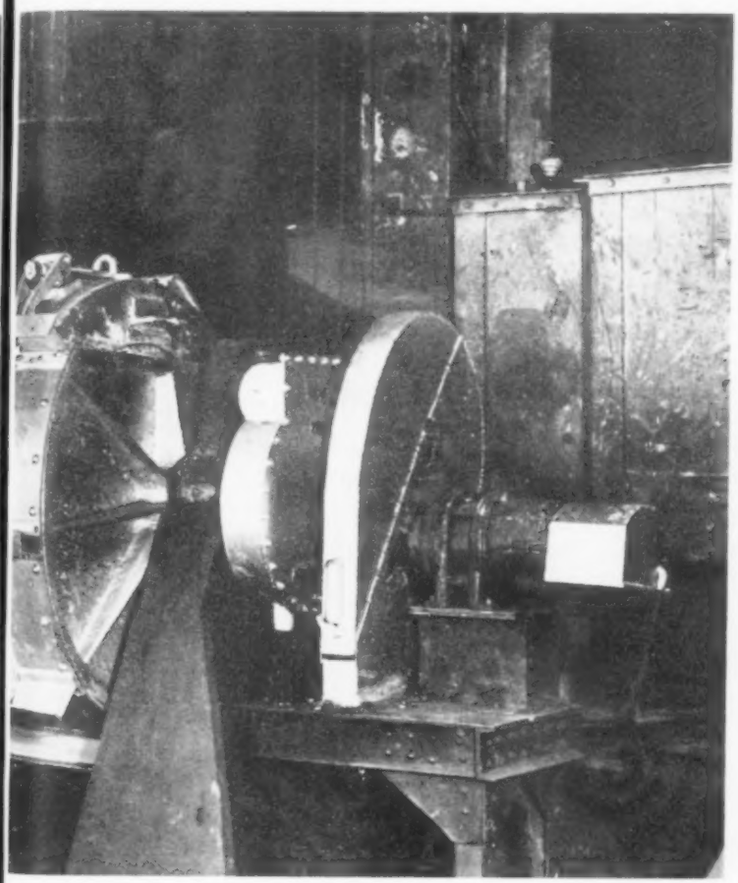
Melting loss for this kind of material is shown in Fig. 4, a table giving the complete report of 26 days' run. Attention is directed to the date 6-9 where the charge represents 50 tons. The actual weight of iron charged that particular day was 102,710 pounds. The melting loss was 4316 pounds or 4.2 per cent. Report for this particular day shows how these weights actually were figured.

Another view of the scrap steel pile, which, in some respects looks like a pile of shredded wheat, is shown in Fig. 5. This illustration shows the method of weighing the charge. A crane operator in the cab above, is dropping a definite amount of scrap steel in the weighing bucket and observing the dial. He readily can tell when he has dropped enough. Manipulation is through an ordinary knife switch. Various other types of switches and rheostats have been tried but the knife switch is the simplest and does a satisfactory job. Entire weight of the various materials is handled in this man-

Left reading down, Fig. 6—Scale car operator again weighs material on a more sensitive scale. Fig. 7—Iron from the spout is being weighed. Fig. 8—View of the briquetting machine. Fig. 9—Present arrangement of the material yard showing various hoppers and scale dials. Fig. 10 (Center above)—Front view of the cupola showing the cylindrical, receiving ladle

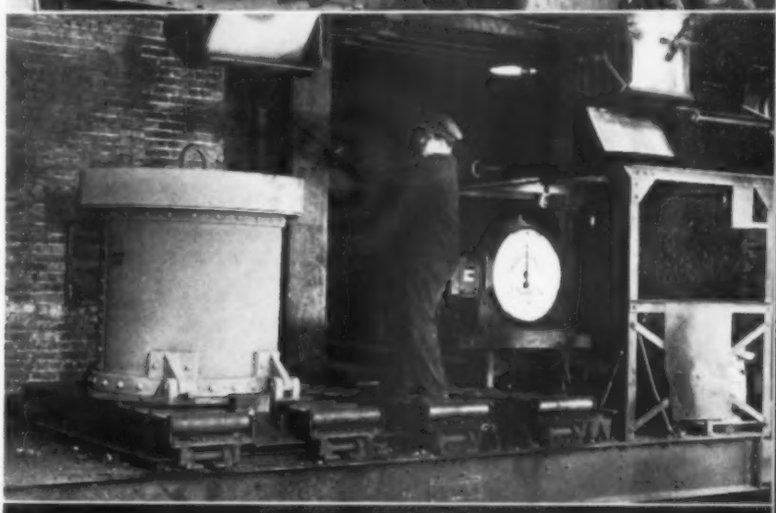
ner. All the operator has to do is to watch the dots on the dial which indicate the various weights of different materials.

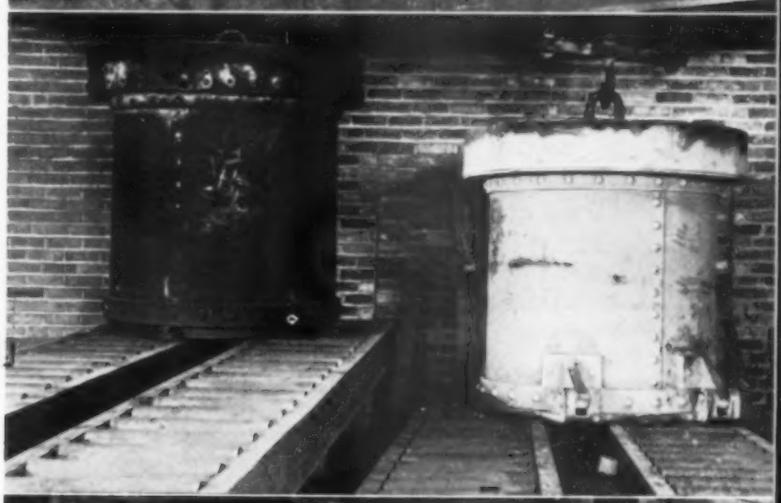
Checking of this particular weight is shown in Fig. 6 where a scale car operator is again weighing the material on a more sensitive scale used primarily for coke and limestone. That is the weight used in these tests. In other words, where the overhead crane man weighed 50 tons of material over the day's run, he actually weighed 102,700 pounds which is slightly more than 50 tons. It is interesting to note that there are only a few days on which the two weights do not check closely. On this 26-day report, the average melting loss was 4.66 per cent.



To carry this test to completion, Fig. 7 shows how the iron was weighed as it was received at the spout. An improvised scale completed the story as far as melting loss was concerned. Reports on melting loss from 11 other foundries varied from 1½ per cent to 12 per cent. Foundrymen generally will admit that 1½ per cent is very good and that possibly 12 per cent is not strictly accurate.

A laboratory report in (*Please turn to page* 115)





Right reading down, Fig. 11—Closer view of weighing pedestal showing magnet directly overhead. Fig. 12—Close-up of transfer scale car for weighing coke and limestone. A different type of bucket is employed for iron charges. Fig. 13—Buckets being conveyed to and from hoisting well. Coke bucket on right is going to and empty iron bucket on left is coming from charging floor. Fig. 14—Crane which lifts the buckets and conveys them to the cupola

QUESTIONS and ANSWERS

Producing an Abrasive Facing On Gray Iron Castings

We have an inquiry for iron castings up to 9 feet in length and from 6 to 24 inches in width. The face of these castings is to be covered with an abrasive material cast on. We shall appreciate any advice you may have on the procedure necessary to produce these castings.

Essentially, the process consists of making the mold in the regular manner. The face of the mold is sprayed with a solution of water glass (sodium silicate) and then a thin coating of the abrasive which may be silicon carbide or aluminum oxide, sold under various trade names is sprinkled over the face through a sieve. The abrasive grain may vary from 12 grit, approximately 0.08-inch diameter, to 30 grit which is about 0.03-inch diameter. The pattern is returned to the mold and rapped down into place to produce a smooth surface. The pattern is removed and a second coating of water glass and abrasive is applied in the same manner. The pattern again is stamped back and removed. Then the face of the mold is skin dried with a torch or in any other suitable manner. It is our opinion that the abrasive face on the casting results partly from penetration of the molten metal among the grains and partly through a fusion of the sodium silicate (water glass) and the abrasive. Alternative binders or carriers to hold the abrasive in place are thin solutions of clay or molasses water.

Diesel Starter Body Castings Sweat Under Pressure

We have some bronze castings weighing about 25 pounds which form bodies for air starters for diesel engines and with which we are having trouble. There is considerable machining performed on the parts, and when they are put on the water test, many of the castings sweat. Can you give us any information on some method to close up the pores—for example a pickle in which the castings could be immersed before or after machining?

Elimination of the leaky castings you mention should begin at the source. Without having a specimen of the casting to examine for possible causes, only suggestions can be made as to what they might be. First of all we believe that it is advisable to check into the melting practice to see that gases are not being absorbed by the molten metal by improper melting.

Gassed metal, as you undoubtedly know, is a prolific source of porosity in nonferrous metals. Such metal may show a good sound surface, but underneath the skin it is filled with extremely fine interstices or channels. In bad cases the metal is full of fine pinholes. Another practice to be investigated is the method of gating and risering the casting. Insufficient feeding will leave voids. The third cause may be improper pouring temperature.

It is possible that you can salvage some of the castings by employing either a sodium silicate (water glass) solution or a synthetic resin compound. In either case the materials which are in liquid form, are forced into the casting under pressure so that they flow into the porous sections. Then the castings are drained, and placed in an oven heated to around 500 degrees where the material is baked in place.

Flour Is Employed To Provide Smooth Casting Surface

Recently we noticed a reference to the practice of flouring nonferrous molds, and the use of strainer gates. Can you give us any information relative to those points?

Use of flour on the mold faces for nonferrous castings is an old procedure that is employed to a great extent by those foundries producing ornamental castings to insure a smooth surface. The method may be used in other types of brass foundries for the same purpose. As a general rule, after the mold is made, the face is sprayed with a dilute solution of molasses which contains about one part of molasses to say 20 or 25 parts of water. Only enough of the solution is sprayed on to insure that the flour will stick satisfactorily to the surface.

Following the spray, flour is shaken onto the surface from a bag, and only enough flour is applied to give thin continuous coating. Any excess flour is blown off the mold face, and from the mold cavity. Flouring is performed on the bench or molding machine since all the materials can be placed within easy reach. Coring, if required, is done after the mold is floured.

Strainer gates or skim gates as they some times are called, are made from dry sand in a variety of forms. One type is about 2 inches in diameter, and about $\frac{5}{8}$-inch thick, and is pierced with four $\frac{3}{8}$-inch diameter holes. The strainer core, of course, is larger in diam-

eter than the sprue, and consequently the pattern must contain a print or boss of the proper diameter which will leave the necessary opening on the under side of the cope. Also a small depression is made in the upper face of the drag in the same manner. The strainer core of course fits into these openings fairly tightly so that the metal can only go through the holes in the strainer gate and not escape around the sides.

White Fracture in Malleable Due to High Annealing

We are forwarding for your inspection a piece broken from an annealed malleable iron casting showing a rather bright fracture. Analysis shows: Silicon, 0.94 per cent; sulphur, 0.079 per cent; phosphorus, 0.139 per cent; manganese, 0.27 per cent; total carbon, 2.04 per cent; combined carbon, 0.04 per cent, and chromium, 0.027 per cent. The condition may be due to intergranular embrittlement, but we have tested for this by bringing some of the castings up to about 1200 degrees Fahr., and then quenching them in water. We understand that this treatment usually will correct intergranular embrittlement and bring the iron back to normal state. This did not occur in this instance. We find further that reannealing makes these castings tougher, but does not change the appearance of the fracture. One analysis showed the presence of 0.027 per cent chromium. Another analysis showed 0.043 per cent. Do you consider this amount of chromium dangerous in malleable iron? Can you account for the presence of this element?

The fracture definitely looks like intergranular embrittlement. However, if this was the cause it would seem that the experimental heat treatment should have altered the appearance of the fracture. Silicon and phosphorus contents are sufficiently low, so that according to Bean's observations, intergranular embrittlement should have been relatively unlikely. The low combined carbon excludes incomplete annealing as a cause of the difficulty. Very few would regard a chromium content of 0.027 per cent as a source of danger. If it had been, the combined carbon would have been high. The chromium in the iron no doubt comes from slight chromium content in the iron ores, in steel scrap and in other purchased material. It is suggested that very high annealing temperatures occasionally show a tendency to produce a white iron fracture.

Wants To Know Maximum Scrap Loss on Cast Housings

We make transmission housings weighing from 60 to 120 pounds. What do you think should be the maximum scrap in the foundry on this type of casting also in the machine shop caused by the operator.

Without a knowledge of all the details involved, it is impossible to set up an arbitrary maximum scrap percentage. For example during the experimental period the allowable loss will be much higher than it will be after the job is running smoothly in production. Accidental variation in the preparation of the sand, the metal charges, or the operation of the cupola may cause a scrap loss for a period out of all proportion to normal. Where these castings are made on a production basis, where materials and methods are closely controlled, the loss in the foundry may not exceed 2 or 3 per cent. Your reference to the machine shop loss is not sufficiently definite.

You ask what is the maximum machine shop loss caused by the operator. Offhand we are inclined to the opinion that the loss caused by the operator is practically nil. If you mean what is the loss due to castings rejected by the machine shop operator, that is something altogether different. It means the number of castings that passed foundry inspection, but are found to be defective in some manner during the machining operation. Many features are involved in this classification, including dimension tolerances, porosity, blowholes and sand inclusions. These defective castings properly are charged to the foundry and not to the machine shop. If properly made and properly inspected castings are rejected in the machine shop in excess of 2 or 3 per cent, sufficient justification exists for more intensive work in the foundry.

Aluminum Pressing Head Leaks Around the Gate Area

We are having trouble with an aluminum head for a pressing machine which has to withstand a steam test at a pressure of 125 pounds per square inch. We use ingot metal 95 per cent aluminum and 5 per cent silicon. The casting is gated into the solid section at one end where the head is bolted to the frame, and a large riser is placed on a corresponding solid section at the other end. The leak always appears at the gated end. At one time we gated them at the sides, but the leaks were worse. We have been told that the addition of a small amount of lead to the mixture will insure a pressure tight casting. We shall appreciate your opinion on this point, or your suggestion of any other suitable alloy.

You are attacking the problem from the wrong angle. The metal you are using, aluminum 95 per cent and silicon 5 per cent is quite satisfactory for pressure tight castings. The fact that the castings leaked along the side when gated in that section, and now leak again in a new gated area should arouse your suspicions. Apparently the runner and gate are not proportioned properly, or if proportioned properly, are not in proper position. Instead of feeding the casting they draw metal away and leave a porous structure through which the steam leaks when the casting is tested under pressure.

Satisfactory results will be secured by gating the casting on top, either through a number of small pencil gates, or one or more small wedge gates. A possibility exists that some of your trouble may be due to a core against which the metal does not lie quietly, either on account of the composition, or because the vent does not escape readily enough through the passages provided for the purpose. Metal in the vicinity of the gate solidifies last and if a small amount of gas is seeking to escape it will become trapped in this area with resultant porosity. However, the evidence submitted seems to point toward the present type of gate as the responsible factor.

Casting Copper for High Conductivity

We are interested in technical data and general information on methods of casting high conductivity copper. In particular we would like to know about molding practice, pouring temperatures used, etc. Are there any books or publications available which include that subject, or deal just with that phase?

As far as we know there is no book devoted to casting high conductivity copper, but from time to time that subject has been discussed in THE FOUNDRY. The first essential in producing high conductivity copper castings is high quality lake or electrolytic copper which possesses the requisite electrical properties. Secondly, melt the pure copper so that oxidation and gas absorption are at a minimum. Thirdly, deoxidize and degasify it just before pouring so that sound castings result without affecting its conductivity.

While green sand molds may be employed for small castings, it is advisable to skin dry the molds to eliminate as much as possible any trouble from moisture. With larger molds, skin drying or dry sand molds are required. Whether green sand or dry sand molds are employed, they should be well vented, and properly blackened with a good grade of blacking. Copper properly deoxidized and degasified will shrink considerably, and large risers should be provided to feed the casting sufficiently. Entry of the metal into the mold should be arranged so that there is the minimum agitation and turbulence.

In melting the pure copper, a layer or cover of charcoal should be maintained on the metal to prevent access of oxygen. The copper should be melted as rapidly as possible and raised to a temperature around 2400 degrees Fahr. The quicker melting can be accomplished, the less gas absorption will occur. As soon as the high temperature is reached, the copper should be deoxidized and degasified with a suitable agent such as calcium boride; boron suboxide; an alloy composed of 5 per cent calcium, 7 per cent silicon and 88 per cent copper; etc.

The deoxidizing and degasifying agent is well stirred in. In all cases the agent must be plunged to the bottom of the molten metal bath to insure effective reaction. If the agent lies on the surface it will not have any effect on the metal. After stirring, the metal again is heated for a few minutes, withdrawn from the furnace, and allowed to cool down to the desired pouring temperature. A suitable temperature is around 2100 degrees Fahr., but it may be more or less depending upon the section of the casting. The best pouring temperature should be determined by experiment.

Make Castings From Split Patterns

We are enclosing sketch of a small plate approximately ⅝ x 3 inches with three serrated prongs about 1-inch long projecting from one face. It is designed for use as a heel plate or for similar purpose. Due to the shape we have been told that it is not moldable, and therefore cannot be produced in a foundry.

Apparently you have been advised by a person or persons who are not familiar with foundry practice. The small reinforcing plate described and illustrated on the sheet accompanying your letter, presents no molding difficulty. Any foundry can make the castings. You only have to decide whether to produce the castings in gray iron or malleable iron. For certain applications, gray iron should prove quite satisfactory. In others the castings can be made of malleable iron. The pattern equipment will consist of a matchplate on which the desired number of patterns are mounted. Each pattern is split through the center and mounted, one half on the cope and one half on the drag side of the plate as shown in the accompanying illustration.

End view of matchplate showing position of split patterns, gate, runner and sprue

Wrinkles Appear on Chilled Treads

We are making mine car wheels 10 and 12 inches diameter in which chill and other features are satisfactory with the exception of the tread face. Despite various changes in practice the tread of the wheel is objectionable, covered with wrinkles and pits. We have painted the chills with shellac, also with oil and we have tried them with no coating. We have used the chills cold and we have preheated them, but apparently without any effect on the tread face.

Wheel chills are painted for the double purpose of *easing* the flow of metal and to provide an insulating film which prolongs the life of the chills. This applies more particularly to railroad car wheels and is not a factor of major importance on the small wheels, 10 and 12 inches diameter. As you have found by experiment, so long as the chills are clean and dry, they function satisfactorily whether they are coated or uncoated. A light coating of oil simply is a precautionary measure to prevent the formation of rust or adhesion of dampness. Wrinkles and pits on the face may be due to one of two, or in some instances, a combination of two causes.

The first is the temperature of the iron and the speed with which the mold is filled. The second is the condition of the sand and careless molding practice. In the first instance, if the metal is cold, or if it is poured too slowly, it will creep up against the face of the chill in a succession of small waves. The thin film on the surface of the metal stiffens sufficiently to hold the indentations in permanent form. The remedy is to pour the metal hot and rapidly. In the second instance if careless molding practice results in loose sand floating on the iron, this floating material sticks immediately it comes into contact with the chill. The remedy of course is obvious. A close examination of the defective area readily will disclose whether the iron or the sand is responsible. You then can adopt the proper remedial measures.

Using Aluminum in Permanent Molds

We are forwarding two small aluminum castings, the top of a hot plate burner for a gas cooker. These were cast in sand molds. The finish is poor and considerable time is required to polish the top. We have experimented with permanent cast iron molds, but the small ring cracks. We shall appreciate any suggestions on casting practice or metal composition. At present we use a metal containing 7 per cent copper, the remainder aluminum.

If a finer grade of sand is available, a much smoother finish may be secured on the face of the castings made in sand molds. The metal you are using now is not suitable for pouring into metal molds. Alloys containing from 3 per cent to as high as 14 per cent silicon are excellent for permanent mold production. Aluminum alloys containing as much as 1½ per cent zinc or iron will create trouble. Aluminum clippings containing manganese fall in the same class.

An excellent alloy for permanent mold work contains: Silicon 4 to 6 per cent, copper from 3 to 5 per cent, impurities 1.50 per cent maximum, remainder alumi-

num. A second alloy also suitable, contains: Nickel 3 to 5 per cent, copper 2 to 4 per cent, silicon 3 to 5 per cent, impurities 1.50 per cent maximum, remainder aluminum. Satisfactory results are secured from No. 12 remelt (copper 8, aluminum 92 per cent) provided the metal is reasonably free from zinc and iron. Where the foundry is not held to a specific analysis and where cost of material is an important factor, crankcases and other good, clean scrap properly rejuvenated with virgin metal and a rich silicon-aluminum alloy, usually will yield surprisingly good results.

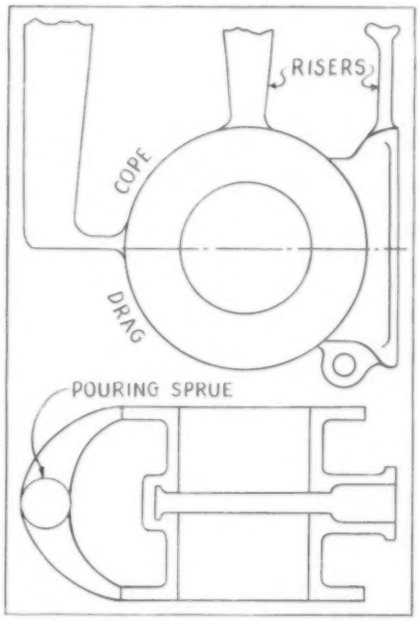
Foundrymen not equipped adequately to analyze and mix alloys will do well to confine their activities to the production of the castings and leave the compounding of the mixtures to a reliable source. The lowest temperature at which the aluminum will flow readily, usually is the best temperature for pouring. The mold should be heated to a temperature of approximately 800 degrees Fahr. A comprehensive treatment of the subject, construction and operation of permanent molds for aluminum is presented in Chapter XIX, *Gates and Risers for Castings*, which may be purchased through THE FOUNDRY.

Has Rough Surface On Valve Casting

We manufacture cast iron gate valves, and frequently supply that type of valve in all bronze, acid resisting metal, for which we use a formula of 77 per cent copper, 8 per cent tin, and 15 per cent lead. The metal seems either to eat or burn into the mold and produces a rough, hairy surface on the casting. We have tried pouring the valves at temperatures as high as 1950 degrees Fahr. and as low as 1750 degrees Fahr., gaged by a pyrometer, without much effect on the condition. We also have tried gating them from the bottom of the flanges so that the metal could enter as quietly as possible, and also tried pouring them from the top. None of the changes seems to have had much effect on the results. We have tried special facings for skin drying which seem to help a little but do not clear up the condition. Valves under 10 inches in size do not cause trouble. The difficulty occurs in the 10-inch and larger valves.

Careful consideration of your problem of obtaining a smooth surface on your gate valves leads us to the opinion that it is caused mainly by a sand condition. In other words, it appears that since the trouble is encountered only in the larger size valves, that the sand is not the right type for the heavier castings, although it undoubtedly serves excellently for the smaller sizes. Presumably, the sand you now are using is a medium size grain, and if the molder rams it hard enough to withstand the pressure of the molten metal, he runs into difficulty from blows, buckles, etc.

Therefore, we believe that you can eliminate your trouble by using a coarse grain sand which can be rammed hard enough without destroying its permeability. Of course, a finer grain sand will have to be used for facing, but only a thin layer of that sand will be employed, and that will not affect the ability of the mold to carry the gases away. Also, it may be advisable to use a coating of blacking, well-sleeked on, over the mold face. That is because high lead alloys seem to be quite fluid, and tend to flow into the narrow passages between the sand grains. Possibly, you are using too much phosphorus for deoxidation. As you undoubtedly know, phosphorus aggravates the searching tendency of bronzes.



Manner in which the gate valve castings are gated

Making a Core for Furnace Casting

Can you give us information on method of making a core for a one-piece radiator for a warm-air furnace?

Two methods are employed in making cores for one-piece hot-air furnace radiators. One is to make an all green sand core, and the other is to make a combination dry sand and green sand core. In both cases the pattern for the radiator, which is split horizontally, serves also as the corebox. In the first method the drag pattern is placed on a flat board which locates it accurately in a definite position. The drag mold then is filled with sand, rammed and rolled over. A sectional arbor is adjusted inside the pattern which is rammed full of sand up to the parting line. Then the upper or cope half of the pattern is placed in position, the lifting bolts are attached, and the remainder of the space is packed full of sand. Seven lifting bolts are used, of which six are located equidistantly over the circular top while the seventh supports that part of the core which projects like a tongue toward the center.

After the cope flask is placed in position and rammed full of sand, it is lifted off and left suspended on the crane while the molder makes any necessary repairs, and removes the top half of the pattern away from the core. The cope is returned to place, and the core anchor bolts are secured to prevent shifting. Then the cope is lifted, and with it comes the entire core and the lower half of the pattern. After those are lifted high enough to clear the drag, they are taken a little to one side and lowered until the pattern almost touches the floor. Wood wedges are driven under the pattern at several points, and then it is rapped to release it from the core. The cope once more is lifted, leaving the pattern on the floor. After any minor repairs have been made to cope and core, the cope is returned to place on the drag, and clamped in place.

In the second method two dry sand rings form the top and bottom while green sand forms the center. The dry sand rings are approximately 4 inches thick. The lower one contains eight chaplet tins spaced equidistantly around the circumferential centerline while the top ring contains eight holes for a similar number of anchor bolts.

The procedure is similar to that previously described in that the pattern also forms the core box. Bottom half of the pattern is located on a board, flask rammed full of sand and rolled over. Lower dry sand ring is placed in the pattern, sectional arbors located, and the pattern packed full of sand. The anchor bolts are placed in position and then the top dry sand ring is put on. The upper half of the pattern is located on the core, the cope flask put on, and rammed full of sand.

Then the cope is lifted off. The top half of the pattern is removed from the core as in this case the anchor bolts do not go through the cope. The core is removed from the drag by a special spider framework. Then the lower half of the pattern is removed, the chaplets put in position, and the core replaced.

Kenneth H. Hamblin

Leroy P. Robinson

L. H. Rudesill

Roy M. Jacobs

MEN of INDUSTRY

L. H. RUDESILL, recently named chairman of the Chicago chapter, American Foundrymen's association, is metallurgist and operating assistant of Griffin Wheel Co. at Chicago. Educated at St. Louis public schools and at Washington university of that city, he has been associated with the foundry industry since 1920. Mr. Rudesill was chief chemist and metallurgist of National Malleable & Steel Castings Co. at St. Louis from 1920 to 1927. In the latter year he joined Gunite Foundries Corp., Rockford, Ill., as metallurgist, remaining with that company until 1934, when he joined Griffin Wheel Co.

• • •

KENNETH H. HAMBLIN, for the past 4 years general superintendent, Thomas Devlin Mfg. Co., Burlington, N. J., in charge of plant operations including malleable, gray iron and nonferrous foundries and machine shops, has been appointed general superintendent in charge of manufacturing, the Keeley Stove Co., Columbia, Pa. Mr. Hamlin has been prominent in the foundry industry for a number of years. After obtaining his technical education at the Rensselaer Polytechnic institute, Troy, N. Y., chemical and metallurgical experience was acquired in the laboratory of Enrique Touceda, consulting engineer of the Malleable Founders' society. Mr. Hamblin then spent 2 years in the capacity of field assistant to the consulting engineer of the American Malleable Castings association. Leaving that work, he located at Providence, R. I., where for 10 years he was superintendent of the Rhode Island Malleable Iron Works. He is active on A. F. A. Committees.

• • •

LEROY P. ROBINSON, director of core oil sales, Werner G. Smith Co., division of Archer-Daniels-Midland Co., Cleveland, has been elected chairman of the Northeastern Ohio chapter of the American Foundrymen's association. Mr. Robinson was graduated from Mt. Pleasant, Iowa high school in 1902 and from Lombard college, Galesburg, Ill. in 1906. For the next 2 years he worked for the Chicago, Burlington and Quincy railroad out of Galesburg as a brakeman. From 1908 to 1910 he worked as a salesman for the National Sweeper Co., Newark, N. J. He then entered the show business and from 1910 to 1914 he played in the leading vaudeville houses of the country. For the next 3 years he was in the real estate business in Detroit. He then became connected with the Werner G. Smith Co. as its New England manager and remained there from September, 1917 to December, 1928 when he was made director of core oil sales and located at Cleveland. Mr. Robinson has been active in association work, both in New England and Cleveland and has appeared on the technical programs of many local groups throughout the country. Recently he visited the West coast and spoke in Seattle, San Francisco, and Los Angeles.

• • •

ROY M. JACOBS, recently elected chairman of the Wisconsin chapter of the A.F.A., is president of the Standard Brass Works, Milwaukee. Mr. Jacobs was born in Milwaukee, and during the time that he attended public schools, he worked in the foundry and machine shop of the Standard Brass Works on Saturdays, vacations and after school. After graduation from West Division high school, Milwaukee, he entered the full time employ of that company, being employed in the factory until 1912 when he was transferred to the office. He was elected president in September, 1925.

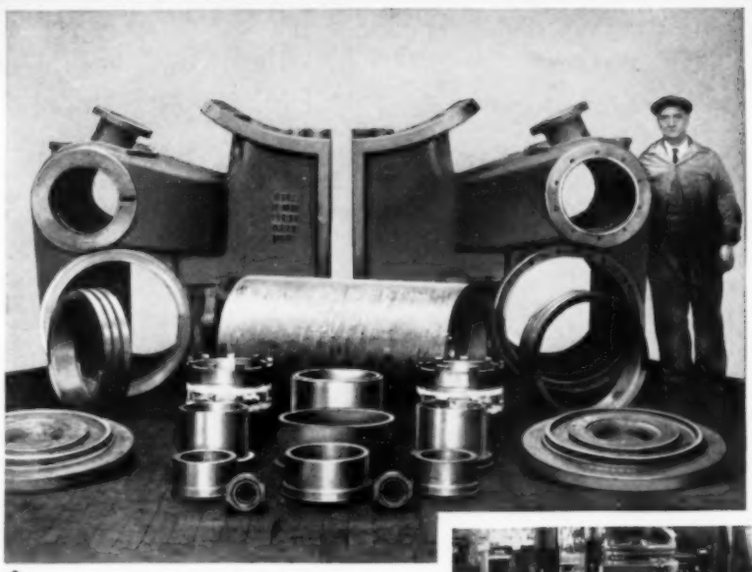
• • •

GEORGE MCCARTNEY recently was made foundry superintendent of the Lumsden & VanStone Co., South Boston, Mass. Mr. McCartney served his time at the Kincaid Foundry Co., Greenock, Scotland, where green sand, dry sand, and loam castings were produced. He went to Canada in 1904 and was connected with the Gurney Foundry Co., Toronto, for several years. He then was made foreman of the General Electric Co., Pittsfield, Mass. under E. J. Sherwin, foundry superintendent. Later he worked with the Niles Bement Pond Co., Philadelphia, was works manager for Levering Bros. Co., York,

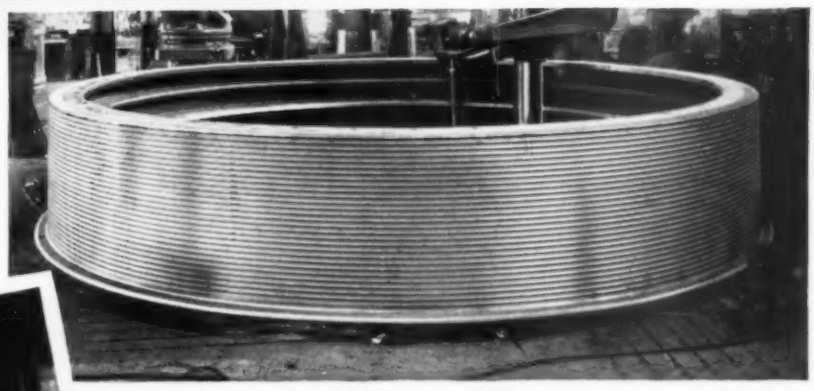
(*Concluded on page* 48)

WHEN COMPLICATED PATTERNS MAKE YOU FRET...

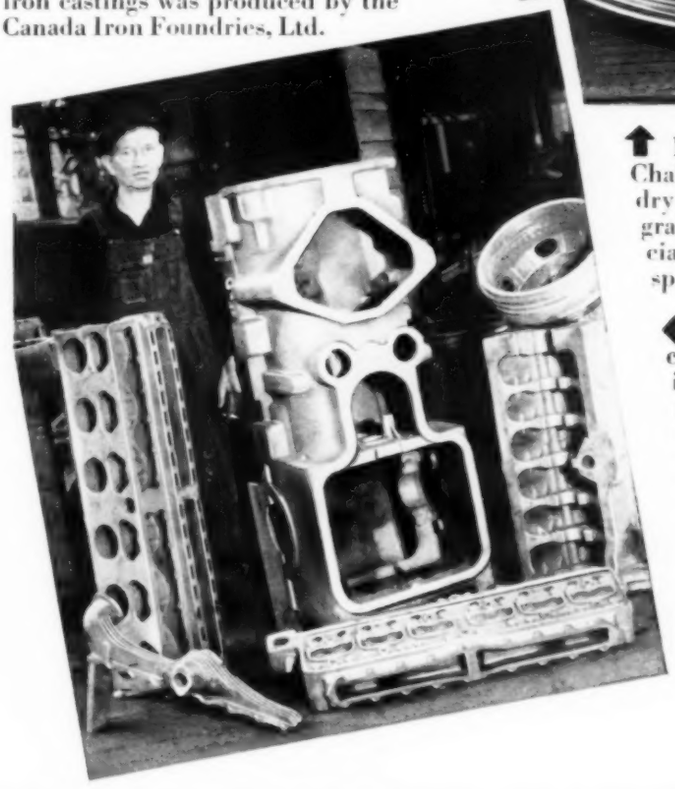
USE NICKEL'S HELP



Strong, pressure-tight wear-resisting alloyed iron locomotive castings retain their strength despite temperature extremes in Canadian National Railway service. Nickel toughens iron, permits almost uniform hardness readings throughout all sections. This 27,000 pound order for Nickel alloyed iron castings was produced by the Canada Iron Foundries, Ltd.



Machining a high-strength iron drum for a 400-ton Allis-Chalmers hoist. As little as 1 to 1½% Nickel makes foundry and shop 100% happier. Nickel cast irons are close-grained, machine easily and smoothly and wear well. Specially heat-treated or chilled Nickel cast irons meet severest specifications of modern engineers.



Every foundryman has tough jobs where shapes, contours, clearances, and engineering requirements seem impossible. Then Nickel helps—preventing chilled corners and edges, increasing strength, reducing machining time, withstanding pressures unapproached by plain irons. Nickel helps avoid rejects. Study these complicated automotive castings made of "Ryanite", a Nickel chromium cast iron alloy produced by Allyn-Ryan Foundry Company, Cleveland.

HELP—WHEN YOU NEED IT

In 24 American and Canadian cities, suppliers of International Nickel products offer practical advice from trained foundry men. Or you may wire or airmail any questions direct to the Inco Engineering Department, 67 Wall Street, New York.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Concluded from page* 46)

Pa., was foundry foreman at the Flockhart Foundry Co., Newark, and was connected with the Ledgerwood Mfg. Co., Newark. He also was foundry superintendent of the Kubler Foundry Co., Easton, Pa.

♦ ♦ ♦

HARRY H. GREEN, superintendent of the Albion Malleable Iron Co., Albion, Mich., for the past 37 years, retired recently.

♦ ♦ ♦

RINEHOLD H. GOELTZ, foreman of the core department of the National Malleable & Steel Castings Co., Sharon, Pa., recently celebrated 40 years of service at that plant.

♦ ♦ ♦

WARREN VAN N. BAKER, formerly foreman of foundries and heat treating, American Steel & Wire Co. South Works, Worcester, Mass., has resigned to become metallurgist, Standard Foundry Co., Worcester.

♦ ♦ ♦

SIMON D. DEN UYL, secretary and assistant treasurer, Bohn Aluminum & Brass Corp., Detroit, has been elected a director of that company to succeed C. W. EGGENWEILER who has resigned.

♦ ♦ ♦

J. R. DUNSFORD recently has been elected president of the Wilson Foundry & Machine Co., Pontiac, Mich. Mr. Dunsford succeeds CHARLES E. WILSON, who continues as a member of the board of directors.

♦ ♦ ♦

P. SCHWIETZKE has been made president of the International Committee of Foundry Technical associations for 1938. DR. GUIDO VANZETTI, Milan, Italy, has been made vice president. TOM MAKEMSON, Manchester, England, is secretary.

♦ ♦ ♦

LOTHAIR TEETOR, since 1932 vice president of the Perfect Circle Co., Hagerstown, Ind., has been elected president and general manager, succeeding his father, the late C. N. Teetor. RALPH R. TEETOR has been elected vice president and head of the engineering division.

♦ ♦ ♦

F. T. HAYS, superintendent of the Fort Pitt Steel Casting Co., McKeesport, Pa., has resigned to become works manager of the Warman Steel Casting Co., Los Angeles. JOHN MARR, formerly works manager, Chicago Steel Foundry Co., Chicago, will succeed Mr. Hays.

♦ ♦ ♦

FRANK F. WISE has been appointed general manager of Koppers Co.'s Western Gas division, Ft. Wayne, Ind., in charge of its manufacturing divisions. Mr. Wise was transferred from company's engineering and construction division, Pittsburgh, with which he had been associated since he graduated from Carnegie Institute of Technology, Pittsburgh, in 1916. R. A. WICKES has been made sales manager of the Western Gas division, and A. G. HALL remains as works manager.

♦ ♦ ♦

H. W. KELLY, recently made foundry engineer, Meehanite Metal Co., Chicago, has had a wide and varied experience. From 1914 to 1917 he was a partner in Kelly & Valerio, Detroit, electrical engineers

H. W. Kelly

and contractors, and from 1917 to 1919 served in the U. S. Army signal corps. In 1919 he became associated with the McLouth Shipbuilding Co., as general manager of the foundry division, and served in that capacity until 1924 when he became connected with the J. P. O'Neil Co. Later he was appointed manager of that firm's Holland, Mich., plant known as the Illinois Specialty Co. From 1927 to 1930 he was general superintendent, Pyott Foundry & Machine Co., Chicago, and from 1930 until 1933 he served as manager of the Springfield, O., division of the National Foundry & Furnace Co., Dayton, O. During 1934 to 1936 he was employed temporarily as consultant and night superintendent, Western Foundry Co., Chicago. He then became staff engineer, Metal Products Engineering Co., Chicago, where he served until joining the Meehanite Metal Co.

♦ ♦ ♦

DEAN HENRY B. DIRKS, Michigan State college engineering school, has been elected president of the Michigan Enginering society, succeeding GEORGE W. FRANCIS of Saginaw.

♦ ♦ ♦

C. H. WHITE, manager of the Deere and Mansur works, Moline, Ill., was elected a director of Deere & Co. at the annual meeting of stockholders, held recently. Mr. White has been employed by the Deere organization for 31 years having started as an apprentice in the foundry. He became head of the experimental department in 1917 and still remains in that work.

♦ ♦ ♦

EUGENE C. SMITH, treasurer, Quality Aluminum Castings Co., Muskegon, Mich., has been elected president of the Clarke Sanding Machine Co., Muskegon.

♦ ♦ ♦

J. M. MCKENZIE, purchasing agent for the West Steel Casting Co., Cleveland since 1922, has left to join the Cleveland Metal Abrasive Co., Cleveland, as treasurer in charge of sales and buying.

♦ ♦ ♦

RICHARD NUGENT, assistant to the president, Round Oak Co., Dowagiac, Mich., makers of stoves and furnaces, has been elected president of the company to succeed HARRY HOWARD, who was made chairman.

♦ ♦ ♦

R. C. VAUGHN has been made sales engineer for the Harnischfeger Corp., Milwaukee, in the New York territory. Mr. Vaughn has had 20 years of experience in the sale of electric hoists and overhead traveling cranes in the New York area.

♦ ♦ ♦

C. W. WHITEHEAD has been appointed vice president in charge of sales of the General Steel Castings Corp., Eddystone, Pa. E. G. HALLQUIST has been chosen vice president in charge of engineering. Other officers and directors have been re-elected.

♦ ♦ ♦

DONALD P. HESS, vice president and director of the Ebco Mfg. Co., Columbus, O., has been elected president and a director of the United American Bosch Co., Springfield, Mass. Mr. Hess will retain his interest in the former company but no longer will take an active part in its management.

♦ ♦ ♦

CHARLES E. O'BRIEN, purchasing agent, Grabler Mfg. Co., Cleveland, has been elected president of the Purchasing Agents association of Cleveland. Other new officers include: Secretary, ALBERT C. MANDER, Bishop & Babcock Co.; and national director, FRANK J. MEKET, Aluminum Co. of America, retiring president of the association.

♦ ♦ ♦

C. R. MCDONALD, vice president in charge of manufacturing, International Harvester Co., Chicago, has retired after 43 years of active service. He will be succeeded by FOWLER MCCORMICK second vice president, who has been in charge of foreign sales. L. P. THAYER, director of foreign sales has been named a vice president of the company and will have charge of foreign sales.

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A POWDERED DRY BOND BINDER
Used Wherever Metals are Cast
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*Reg. U. S. Pat. Off. by Hercules Powder Company

If you failed to get a copy of this new Truline Binder* booklet at the Foundry Show, we shall be glad to send you one. This booklet describes the advantages of using Truline Binder in cores wherever metals are cast.

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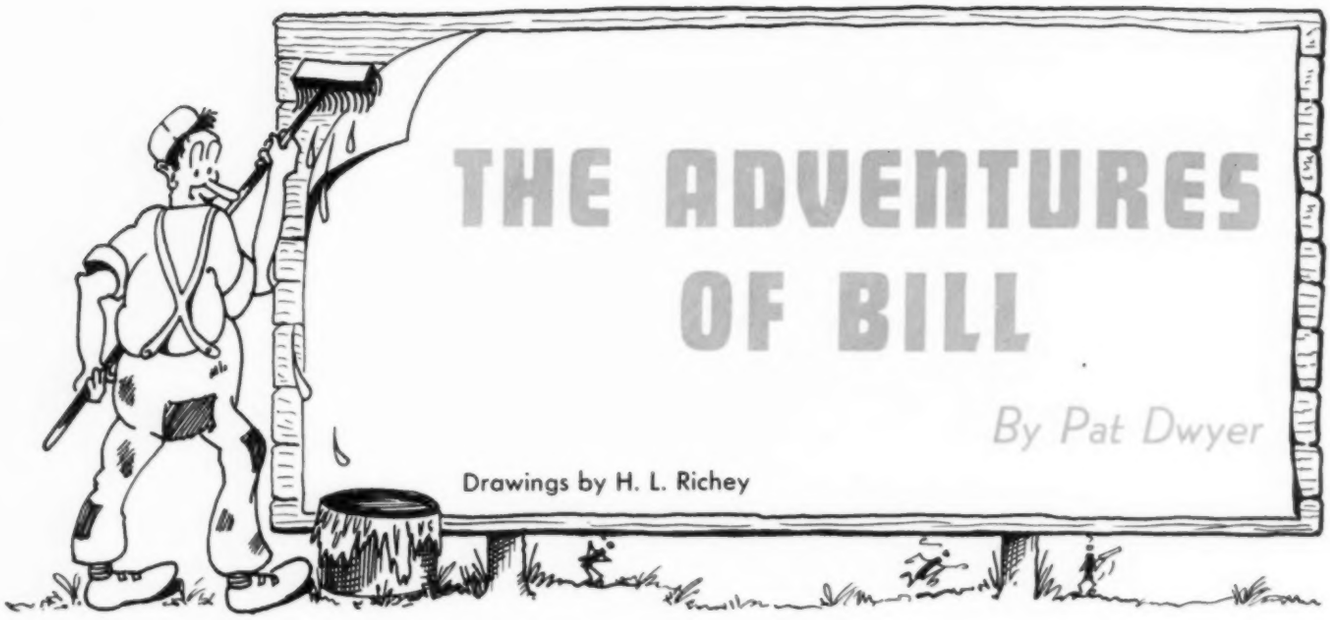


THE ADVENTURES OF BILL

By Pat Dwyer

Drawings by H. L. Richey

"PARDON ME" said the young man with the pad and pencil "but my editor has assigned me the job of doing a story on this convention. I have attempted to interview several people, but invariably before the interview was fairly under way, one or sometimes three or four boisterous individuals burst in to shake my man by the hand, to slap him on the back and to drag him off to see Tom, Dick or Harry. All I got was the dog eye and a fat lot of good that is in the composition of a story. The last man I met paused long enough to point you out and suggest that you could tell me all I want to know. In fact he said you could give me some inside stuff that older and more conservative members would hesitate to discuss."

"Just making a stab in the dark," said Bill, "was this gent a little weasel eyed guy with a crooked puss and one ear slightly off the perpendicular?"

"In a general way that hits him off. Also he was chewing tobacco."

"Shorty McGee. I'll have a word with the little bum the next time I see him. That lad always was a perfect genius in getting some other person to do his work for him. I never could figure out whether he was tight or just plain lazy, but in one shop where we worked together down east he was known as Moocher McGee—Mooch for short—through his uncanny ability to chew tobacco constantly without going through the formality of exchanging any coin of the realm for it. Now you meet him and ask him a civil question and he begrudges you a few minutes of his precious time. Still the same old Moocher. Did he try to borrow anything from you?"

"Well, now that you mention it he asked for a cigaret and then absent mindedly dropped my lighter in his vest pocket. He started to say something about a place he had discovered down the street where the beer was remarkably soothing and refreshing, but two or three noisy lads came along, nipped him by the arms and carried him off. Over his shoulder he shouted back that I should see you."

"As a sterling young reporter, I suppose you remember his exact words?"

"If you insist. Apparently he was in high good humor, heart of gold; when you call me that, smile; and all that kind of stuff, if you know what I mean."

"I get you," said Bill. "So he smiled, hey? Well, of course that makes a difference. Referred to me as a crocodile or a hyena maybe or one of the more venomous and noxious species of snakes. He always had a gift for thinking up pet names for his friends. Some day he is going to think up one too many and then one of the appreciative friends will put him away for good in a pickle barrel."

Reporter gets inside dope on foundry

"That's a funny coincidence. What he actually said was, 'I ain't got no time now to talk about the foundry. You ask old pickle puss over there in the corner, the guy with the stogie and the hat pulled down over his eyes. He can give you all the dope.'"

"Ah, yes! My little dopey friend. If you will be kind enough to give me an inkling, just an inkling you understand, of what you intend to present in this story, I shall endeavor to the best of my modest ability to remove the lid and show you what makes the works tick. Are you interested in the personnel, the equipment, the notables, the experts presenting papers, the aims and objects of the association, the life history of Ed Hoyt, or what possible attraction a show of this kind has for the ladies who attend in large numbers every year. Speak up my boy. I am not as busy as the Moocher, but I do not mind admitting that I am not overly enthusiastic in contributing precious information that is almost sure to be garbled more or less before it appears in print. I never have seen in a newspaper, a foundry story that was not as full of errors as a Swiss cheese is full of holes. However, that is your worry, not mine. Proceed."

The young man graciously admitted the possibility of a few errors creeping in to a story where a man unfamiliar with the field had to work

(*Continued on page* 53)

ADVERTISING PAGES REMOVED

(*Continued from page* 50)

at top speed. That was the reason he would appreciate a brief technical description of how castings are made. Information on the other items, personnel, equipment, and all that kind of stuff, he could secure in the ordinary routine manner.

"Well," said Bill, "I'll tell you. At one time the production of castings involved specialized training and a high degree of manual skill and dexterity. All done now by machinery and higher mathematics. In the old days the molders were hard, tough guys who pounded sand, wore old clothes and indulged in weight lifting contests and other rough sports when off duty. Take a look at some of the birds around here. Manicured finger nails. Clothes that would cause Solomon and the lilies of the field to curl up and die of envy. Bragging sessions are confined to speedometer records, cocktail capacity, number of strokes required to propel a ball from one end of a golf course to the other, and the extremely fatiguing sport of laying cards on a table in orderly sequence.

"This renaissance — better look that up in the dictionary—I can say it but I can't spell it—this renaissance dates back to the war years when the old hand molding methods could not keep up with the demand for castings required in our highly civilized methods of wiping large numbers of men out of existence. After the war—"

"I hate to interrupt you." The knight of the quill apparently was getting itchy. "I have a dead line to meet. How about a few words on how castings are made?"

"All very simple, my boy, all very simple. The raw sand is stored in large hoppers where a chemical process removes offensive odors, silicosis germs and the pollen responsible for hay fever. An operator in easy neglige sitting in a rocking chair, pushes a button at regular intervals and a measured volume of sand falls into a container. A push on a second button causes a plunger to make an impression in the sand corresponding to the shape of the desired casting. A large cauldron of molten metal is kept constantly simmering over an open fire and after a sufficient number of molds have been made an attendant dips the metal out of the pot and fills the molds. After the castings have cooled they are removed, trimmed on a grind stone and given away to customers for a slight consideration."

"Are you not ashamed," I said to Bill after the young man had departed, "to take advantage of an innocent creature and hand such a mess of misinformation?"

"No," said Bill, "I'm not. I had an experience many years ago that

How to meet friends and like 'em

kind of soured me on truthfully answering every question. How do I know that lad was a reporter? How do I know he was not kidding me? If I had told him the exact truth how do I know that he would not distort it according to his own low conception of humor and thereby make me ridiculous? The modern newspaper reporter has neither ethics nor conscience. Accuracy never is allowed to stand in the way of a bit of sensationalism. However, this incident I had in mind was not connected with newspapers or reporters. It was brought to mind recently when I was asked to say a few words at a foundry meeting in an eastern city.

"The apparently friendly and spontaneous reception made me feel something like the Prodigal Son. You know the lad who came home from foreign parts with the toes sticking through his shoes, the back out of his pants, expecting nothing but a sour look from the old man, a bite or two from the family dog and a shakedown for the night in the dog house out back of the barn. I thought I noticed one or two holder-outers in the back row—probably from Maine or Vermont—but on the whole and offhand I should say the reception was favorable.

"This was in distinct contrast to the—shall we say—placid indifference, if not—and I choose my words carefully—actual hostility which greeted my first appearance in the same city about 40 years ago. Not quite as far back as the days of Paul Revere and his pals; of Roger's Rangers and the champion windbag and delightful blackguard Cap Huff, but long enough ago to absolve any of the present generation from hostile intention.

"At that time I was a young molder doing the grand tour. Borrowing for the moment the technique of one of my favorite radio artists I might say that Bounding Bill I was knowed as in them days. Bounding Billy from Bangor, Maine, to San Bernardino, Cal.; from Benton Harbor to Baton Rouge where the bambinos and the boll-weevil dance the bolero on the bayous; from Boston, Mass., the home of the bean and cod to Bumminam, Alabam, and from Battlecreek to Bethlehem, P.A., hot diggity—er—ah—Well just let it go at that, hot diggity.

"Winds of chance and professional curiosity brought me to this seaboard city where I confidently anticipated catching a job. To my surprise and deep chagrin the foundrymen in the district showed a singular lack of appreciation of the opportunity presented to secure the services of a sterling artist. In a word, they all said 'No.'

"One burly foreman, who I am sure at a former period must have been a bucko mate on a bluenose

(*Concluded on page* 112)

Looks like a promising field for operators with former punch board experience

Foundrymen Meet at Lansing

APPROXIMATELY 150 men connected with the foundry industry in practically every capacity attended the seventh annual foundry conference sponsored jointly by Michigan State college and the Detroit Chapter of the American Foundrymen's association, April 15 and 16 at Michigan State college, East Lansing, Mich. Technical sessions were conducted in Olds Hall of Engineering, while luncheons, dinner and other social activities were staged in the Union building. Official welcome was extended by Robert S. Shaw, president Michigan State college.

Interesting features outside the technical program included addresses on China by Capt. H. J. Golightly, United States Army; and *Depressing Moments* by W. L. Rybolt, president Rybolt Heater Co., Ashland, O.; and a demonstration of marksmanship by a member of the Michigan State police.

On the afternoon of the second day and the conclusion of the formal program, the party divided into groups for inspection of the campus and for various demonstrations in different buildings. Analysis of stress distribution with polarized light was explained by Prof. C. M. Cade in the civil engineering department, Olds hall. In the horticulture building Roy E. Marshall, professor of pomology demonstrated the flash pasteurization of cider process. Inspection of the State police plant was conducted by D. Bremer, supervisor of course in police administration. Crystal growth was shown by Henry L. Publow, professor of chemical engineering in Olds hall.

Technical sessions on Friday and Saturday were devoted to a symposium on casting defects, causes and remedies considered under three general heads: Molding and core sands for gray iron, steel and malleable iron; metal casting defects, causes and remedies; and part played by equipment. The first was under the chairmanship of V. A. Crosby, Climax Molybdenum Co., Detroit; with Harry W. Dietert, H. W. Dietert Co., Detroit as discussion leader.

Robert Adams, National Steel & Supply Co., Toledo, O., and John Lowe, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., served as chairman and vice chairman respectively at the second session where discussion on the various topics was conducted by E. K. Smith, Electro Metallurgical Co., Detroit; James H. Lansing, Malleable Iron Research institute, Cleveland; and H. S. Austin, Buick Motor Co., Flint, Mich.

Discuss Foundry Equipment

In the session on the part played by equipment with R. G. McElwee, Vanadium Corp., of America as chairman, patterns and flasks were discussed by Vaughn Reid, City Pattern Works, Detroit. Pat Dwyer, engineering editor THE FOUNDRY, Cleveland, led the discussion on gating. Discussion on risers and vents, covered ladles, skimmers, etc., was led by Carl Joseph, Saginaw Malleable Iron Division General Motors Corp., Saginaw, Mich.

Special equipment designed for the examination and control of molding and core sand was displayed and demonstrated by H. W. Dietert in his discussion of the part played by sand in the production of castings. Defects traceable to sand were considered under the following heads: (1)—Blows, caused by high moisture, low permeability, high mold hardness. (2)—Pin holes, caused by metal, low permeability, high moisture. (3)—Dirt—, caused by loose dry sand, soft cores, ragged gates and mold, low green or dry strength, agitation of metal. (4)—Penetration, caused by coarse grains, low flowability, excess green strength, close cores or flask, low mold hardness. (5)—Rat tails and buckles caused by low green strength, low moisture, high mold hardness, excess dry strength with high moisture or high mold hardness. (6)—Sand burns, caused by low sintering and high strength. (7)—Swells, caused by low mold hardness, low green strength. (8)—Cold shuts caused by low permeability. Part of the demonstration consisted in ramming small sand cylinders of various compositions and then placing them in an electrical device where they were raised to a bright red heat, to show how sand reacts at the high temperatures encountered.

Factors responsible for chilled edges and corners, porosity and leaks in castings, were discussed by E. K. Smith, Electro Metallurgical Co., Detroit. According to the speaker the most prevalent causes are high blast, moisture, low bed, oxidized scrap in charge and the condition of sand in the mold. In the ensuing discussion several speakers referred to inverse chill where the metal on the outside is gray with a chilled or white area on the inside. Instances of this peculiar and

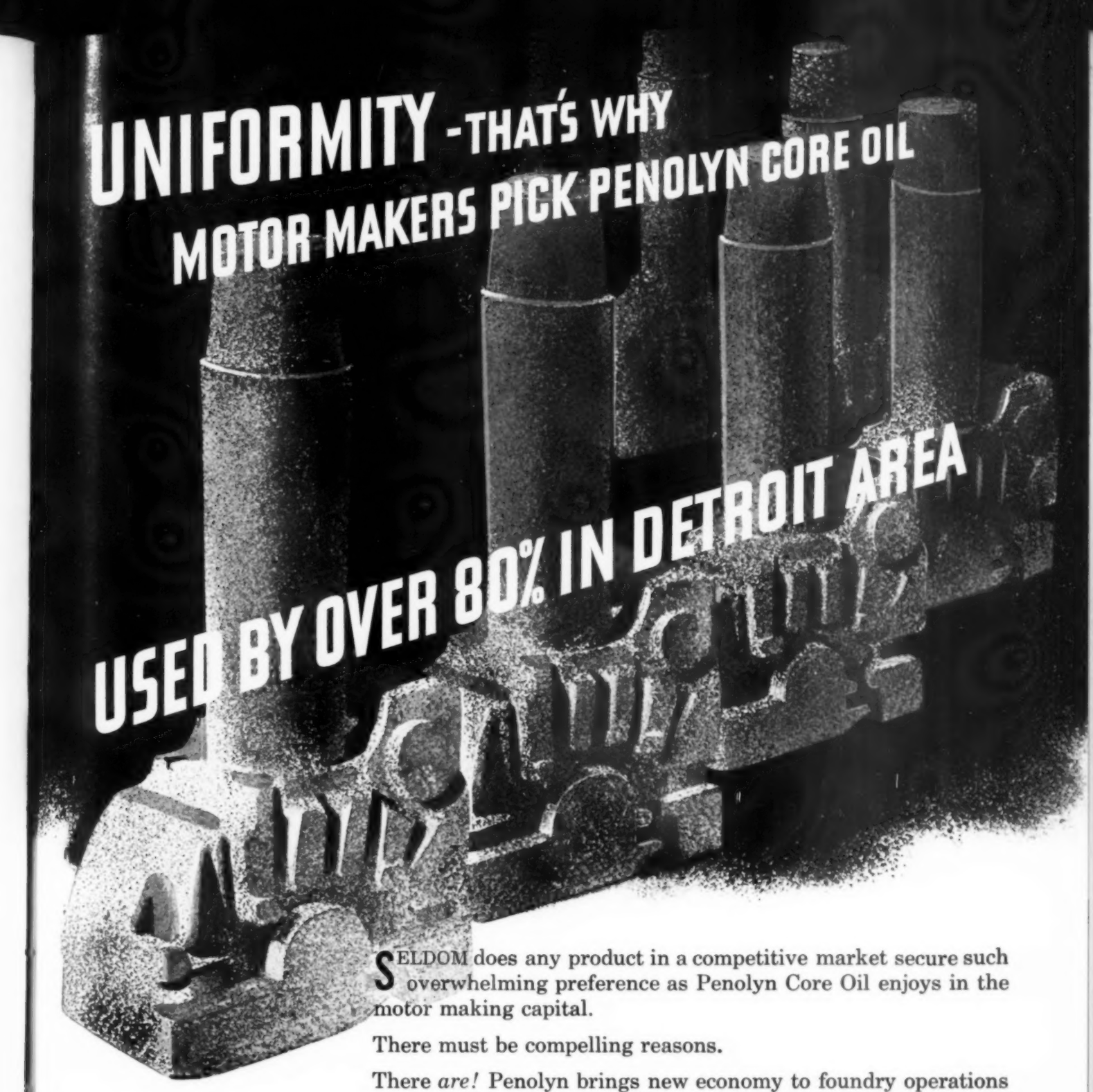
(*Concluded on page* 56)

Vaughan Reid
City Pattern Works
Detroit

W. L. Cockrell
Michigan State College
East Lansing, Mich.

H. W. Dietert
Harry W. Dietert Co.
Detroit

H. J. Deutsch
Aluminum Co. of America
Detroit



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(*Concluded from page* 54)

contradictory phenomenon pop up regularly at every foundry conference and while theories are advanced by different speakers, no person up to the present has presented a theory that satisfies every person. H. M. Lane claimed that moisture is responsible and in support of his contention stated that at one time he had carried on a series of experiments. After wetting the ladle lining before filling it with metal, he could produce this internal chill in the first castings poured.

Illustrating his paper with a number of slides, Elmer Carmody discussed the causes of shrinks and blowholes in castings, both singly and in combination. Shrinks are caused by poor melting practice, incorrect heat gradient, improper iron composition, incorrect gates and risers, improper pouring rates and temperatures and incorrect design of casting. Oxidized iron is a prominent cause. This metal has a higher freezing point than normal iron and therefore a shorter fluid life.

Blow holes are caused by the generation and accumulation of gas which does not escape either through the sand or through the metal. In many instances where the metal is sufficiently fluid the gas will work its way through before the metal solidifies. In a less fluid metal poured under similar conditions the gas will be trapped to form blow holes. Iron that bubbles or boils in the ladle will form blow holes in the casting. Oxidized iron or iron melted repeatedly may be responsible. The slides used in connection with the paper showed a wide variety of castings before and after certain remedial factors were adopted to eliminate blow holes, cracks, etc.

A paper prepared by Enrique Touceda and James H. Lansing, Malleable Founders Research institute, Cleveland, on metal cracks, cold shuts and misruns was presented by Mr. Lansing. Cracks in castings may be traced to two causes: Mechanical operations and inherent metallurgical conditions. The first includes gate and sprue removal, trimming of thin fins, tumbling, grinding and straightening. The second includes: Internal strains, minute hot tears, deep dendrites, effect of cohesion, hard cores, unequal cooling, faulty metal composition, incorrect gating, corners or abrupt change in section, failure of metal to knit properly in certain sections. Each of these items was considered in detail. Complex castings should be placed in a soaking pit or oven to retard cooling rate and thus reduce tendency to internal strains. Two or more gates of 10 per cent greater combined area should be substituted for one large gate on plate castings. Pouring metal on the cold side and holding sulphur and oxygen as low as possible will minimize the tendency toward hot tears. Mold should be constructed in a manner to provide for contraction of the casting.

Freezing hard iron forms dendrites or planes of weakness. Resulting columnar structure to a certain depth below the surface weakens the metal. High pouring temperature and lack of density of the metal facilitates the growth of dendrites. Conflicting rates of freezing affects lack of density at certain sections, stimulating the growth of the main axis of a dendrite at these sections. Since malleable iron contracts approximately 5.5 per cent in cooling, cores and mold should be constructed in a manner to permit contraction. On account of unequal section in many castings, resort must be had to chills and other special measures to promote equal cooling rate. Sulphur and oxygen should be low so that metal will not be too tender during solidification. All else being equal, low silicon increases susceptibility to cracks. Sulphur and manganese must be in proper adjustment.

Metal Draws Away

Gates generally speaking should deliver the last metal to the thin sections. Because of action of cohesion, metal in a thin section will draw metal from an adjoining thick section. Filleted corners will cool more slowly than other areas, consequently the draw on the crotch may reduce density of the fillet.

Metal causes of misruns include: Lack of fluidity due to faulty chemical composition, insufficient fluidity due to low temperature, faulty pouring, faulty gating. Metal causes of cold shuts includes: Oxide film pushed ahead of flowing metal, gas in mold, faulty pouring, faulty gating.

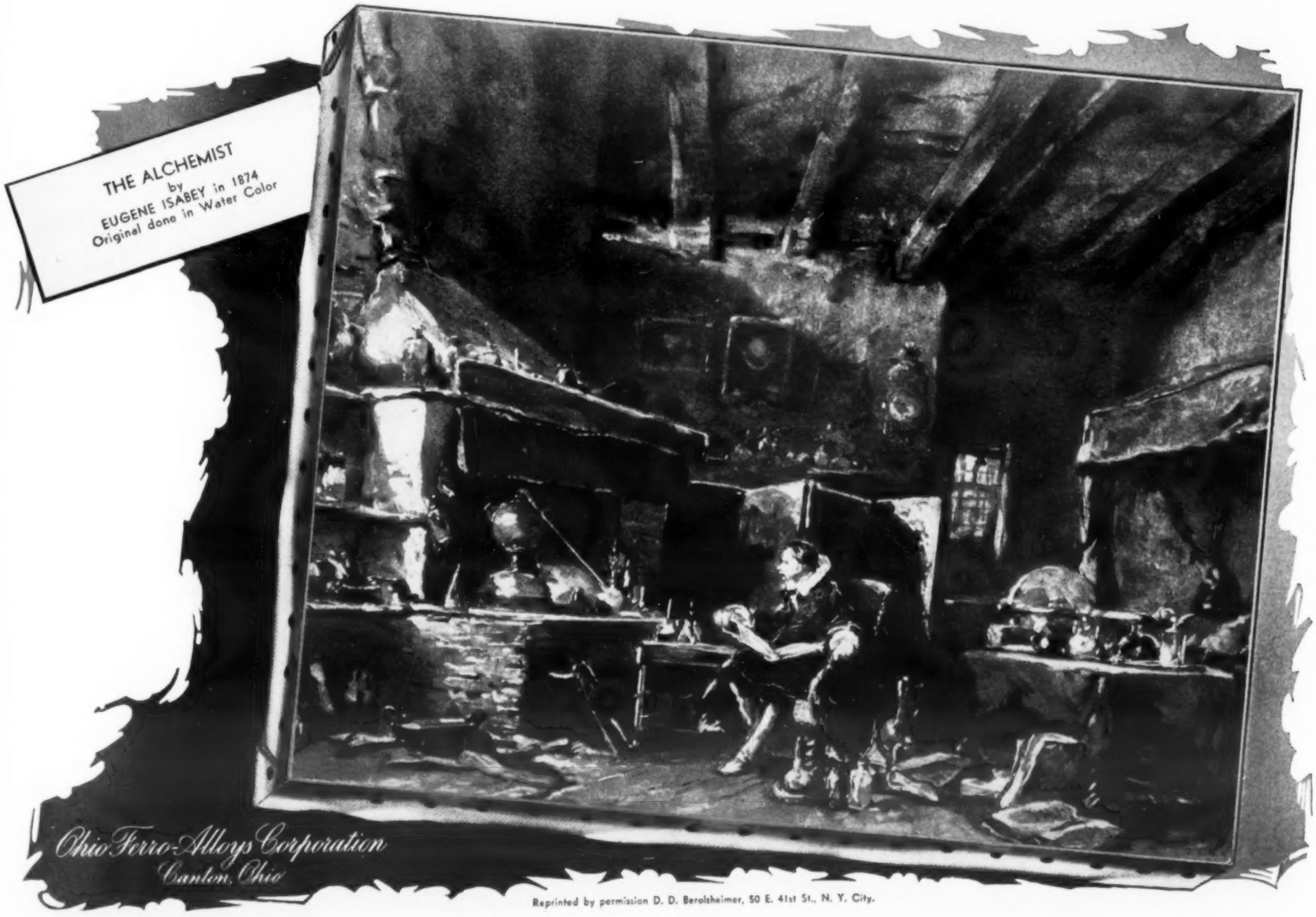
In a paper on inclusions and breakage, H. S. Austin, Buick Motor Co., Flint, Mich., stated that the principal cause of inclusions in the metal may be listed as: Slag formed from ladle linings and ladle additions, hot spots on which ingredients from mold or core have fused, loose sand either present in the runner basin, sprue or gates, sand or blacking detached from the mold or core face, scabs, low sand permeability, excess moisture, hard ramming, hard cores, weak sand, size, shape and position of gates, boiling metal, ragged edges on molds or cores, lack of proper vents, excess paste at core joints. A common form of inclusion is dirt or slush caused by steam passing through the metal with resulting disturbance and oxidation and consequent combination of oxide, dirt and shrink. To identify the various inclusions, the initial step in elimination, the speaker recommended a binocular microscope with deep focus and medium magnifying power.

At the closing session Vaughan Reid, City Pattern Works, Detroit claimed that only the best materials should be employed in pattern construction. As a corollary he also claimed that not only should discretion be shown in the selection of apprentices, but that every effort should be made to develop these apprentices along proper lines. His paper covered many practical points in the use and care of patternshop equipment. Unsatisfactory surface on many aluminum alloy patterns may be traced to unnecessary handling of the molten metal and consequently formation of oxides. In his shop the same pot in which the aluminum is melted, also is employed to pour the metal into the molds. Replying to a question from the floor he stated that chromium plating of patterns is not practiced to any great extent.

Pat Dywer, engineering editor THE FOUNDRY discussed the subject of gates and risers and the manner in which they may be responsible for scrap castings. Some of the points covered included. Controlled solidification, cold shuts and causes, slow and fast pouring, chill faces, rolls, plates, top and bottom pouring, condition of the sand, skim gates, dirty gates and pouring basins. Risers open and closed, height of head, strained molds, hot and cold metal, set gates and tiles.

Risers and vents, covered ladles, temperature of metal and other related factors in the production of malleable iron castings were discussed by Carl Joseph, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich. Insulated, covered ladles have proved a decided economic installation. In addition to preventing any appreciable loss in temperature in the metal between the furnace and the molds, the lining in these ladles, a mixture of silica and alumina oxide, stands up for an average of 80 heats as compared with a life of 3 or 4 heats in the open ladles formerly employed.

Officers of the Detroit Chapter of the A.F.A. are as follows: Chairman, R. B. Crawford, Atlas Foundry Co.; vice chairman, Ira F. Cheney, Griffin Wheel Co.; secretary, Harry J. Deutsch, Aluminum Co. of America; treasurer, W. W. Bowring, Frederic B. Stevens Inc. Committee in charge of the foundry conference at Michigan State college included V. A. Crosby, Climax Molybdenum Co.; Fred J. Walls, International Nickel Co.; H. W. Dietert, H. W. Dietert & Co.; R. G. McElwee, Vanadium Corp.; H. J. Deutsch, Aluminum Co. of America; Dean H. B. Dirks, division of engineering, Michigan State college; Prof. W. L. Cockrell, department mechanical engineering, Michigan State college, East Lansing, Mich.



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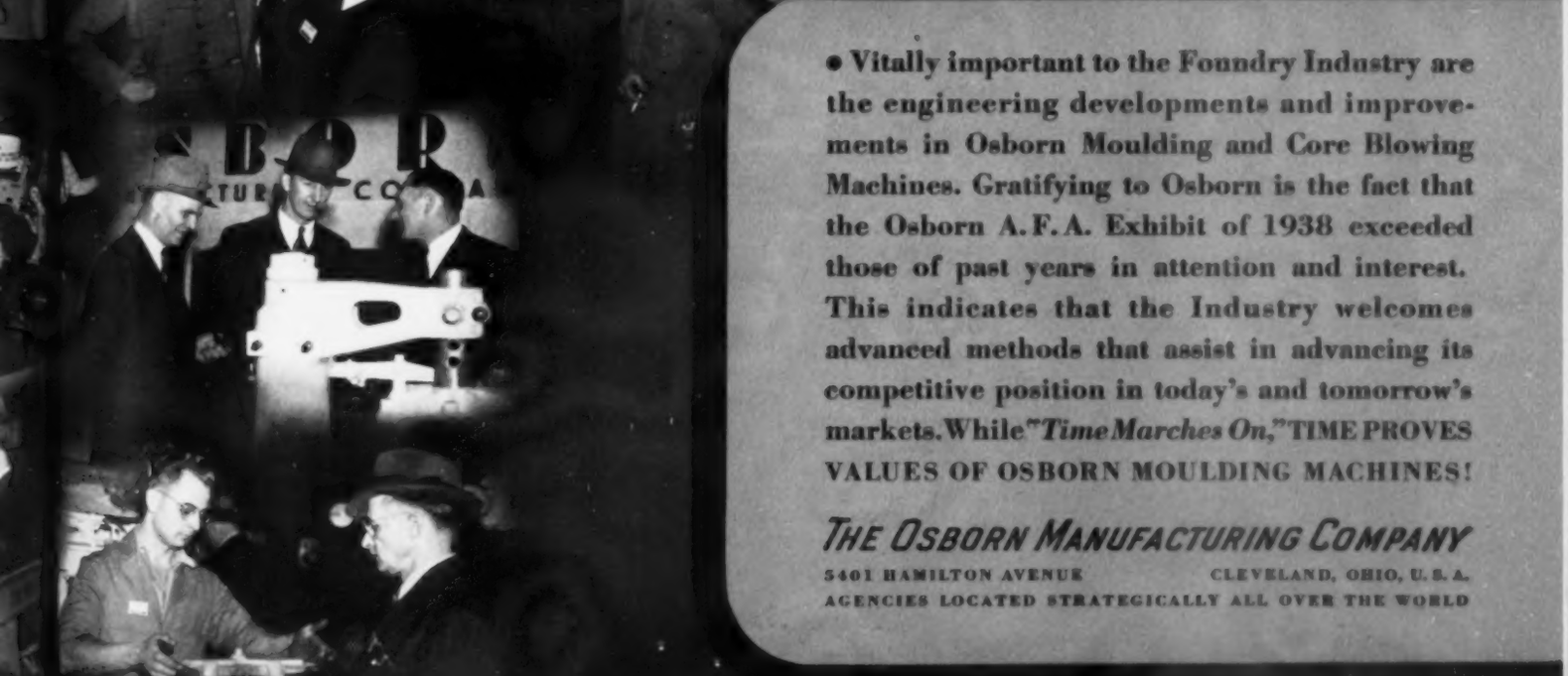
Among those present at the OSBORN A.F.A. exhibit

Pictures, like actions, speak louder than words. We could say that the Osborn A. F. A. Exhibit attracted widespread interest of Foundrymen. But the pictures taken by the Osborn candid camera man speak louder than words.

OSBORN

Moulding



• Vitally important to the Foundry Industry are the engineering developments and improvements in Osborn Moulding and Core Blowing Machines. Gratifying to Osborn is the fact that the Osborn A.F.A. Exhibit of 1938 exceeded those of past years in attention and interest. This indicates that the Industry welcomes advanced methods that assist in advancing its competitive position in today's and tomorrow's markets. While "*Time Marches On*," TIME PROVES VALUES OF OSBORN MOULDING MACHINES!

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Machines

Milwaukee

MILWAUKEE Chapter of the A.F.A. elected Roy M. Jacobs, Standard Brass Works, as chairman at the regular monthly meeting held April 22 at the Schroeder hotel, Milwaukee. Other officers were elected as follows: W. J. MacNeill, Federal Malleable Co., vice chairman; B. D. Claffey, General Malleable Corp., secretary; W. J. Donnelly, Smith Steel Foundry Co., treasurer; H. R. Donald, Interstate Supply & Equipment Co., and Ray Flansburg, Belle City Malleable Iron Co., Racine, Wis., directors for 3-year term. A. F. Genthe, Harnischfeger Corp., was elected director to fill a 2-year unexpired term.

Walter Gerlinger, Walter Gerlinger Inc. and retiring chairman of the chapter, presided at the meeting which 125 foundrymen attended. Four technical discussions featured the program. The gray iron discussion was led by George A. T. Long, Pickands Mather & Co., Chicago; malleable by Ray Flansburg, Belle City Malleable Iron Co., Racine, Wis.; steel casting by T. V. Armstrong, International Nickel Co., New York; and the nonferrous by H. J. Rowe, Aluminum Co. of America, Cleveland. A proposed amendment changing the name to the Wisconsin Chapter of the A.F.A. was announced.—*W. J. MacNeill, vice president.*

Northern California

NORTHERN California chapter of the A.F.A. held its regular monthly meeting April 8 with Vice Chairman John D. Fenstermacher presiding. After dinner at the Whitcomb hotel and routine chapter business, reports of committees were received. The iron founders committee reported that the question of sales and user tax on coke had been revived and that concerted effort was being made to present claims for exemption before the California state board of equalization.

The committee for the statewide meeting of foundrymen April 23 at Fresno reported the coke tax as a subject for discussion at that meeting, the main object of which is cooperation of California foundrymen on affairs of interest to the industry. Mr. Fenstermacher gave a report covering the high points of interest of the Western Metals congress which was held in Los Angeles March 21 to 25.

J. William Fehnel, chief chemist of the public health department, Metropolitan Life Insurance Co., gave an interesting, technical talk on silicosis. Mr. Fehnel is an acknowledged authority on silicosis and his discussion opened the way for a free discussion in which many took part.—*George L. Kennard, secretary.*

New Jersey

MARSHALL POST, vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., described the Randupson process of producing castings before a large gathering at the New Jersey Foundrymen's association meeting at the Downtown club, Newark, N. J., on April 27. Approximately 135 were present. Previous to Mr. Post's talk, John L. Carter, secretary of the group told the members that five bills pending in the New Jersey State legislature and opposed by the association, apparently had been squashed for this session. Those proposed enactments included a pneumoconiosis bill which he said contained features which would have imposed an unfair burden on foundrymen of the state. Mr. Carter also announced that the Worthington Pump & Machinery Corp., Harrison, N. J., had become a member of the association.

In beginning his talk, Mr. Post stated that the E. & G. Brooke Iron Co., Birdsboro, had just completed 150 years in business, and some of the old furnaces still are standing. The present furnaces produce 400 to 500 tons of quality, merchant pig iron a day including low phosphorus pig. He pointed out that the Brooke company pioneered and developed a sintering process for preparing raw ore which benefited the eastern magnetic ores for blast furnace reduction.

Discussing the features of the Randupson process which is a cement bonded, sand process developed in France, Mr. Post said that molds can be made from any pattern designed for dry sand molding, by the core box method, or if symmetrical, by the sectional method; thus providing for considerable versatility. He also said that if patterns were designed for the process, savings could be made in pattern cost construction, for often a half, a quarter or even an eighth of a pattern is all that is necessary.

Illustrating his remarks by lantern slides and by motion pictures, he pointed out that on dry sand and green sand work, most flasks and drying ovens have been eliminated at the Birdsboro plant. He cited several outstanding advantages of the process, such as: Dimensional accuracy due to freedom from mold warpage and distortion because artificial drying is not used; cleaner surface and accurate pattern outline; relative freedom from scabs, pin holes and blow holes, and a sharp reduction in the gaggers and nails. Very little nailing is necessary on steel castings, he said. On the large iron jobs few nails are necessary on corners or fillets, but on small iron jobs, no nailing is required.

In the animated discussion which followed Mr. Post said that the process required about one-third of the cleaning time that was necessary before it was applied at the plant about three years ago. He said it was necessary to sandblast steel but not iron. He declared that the use of clay was most harmful to the

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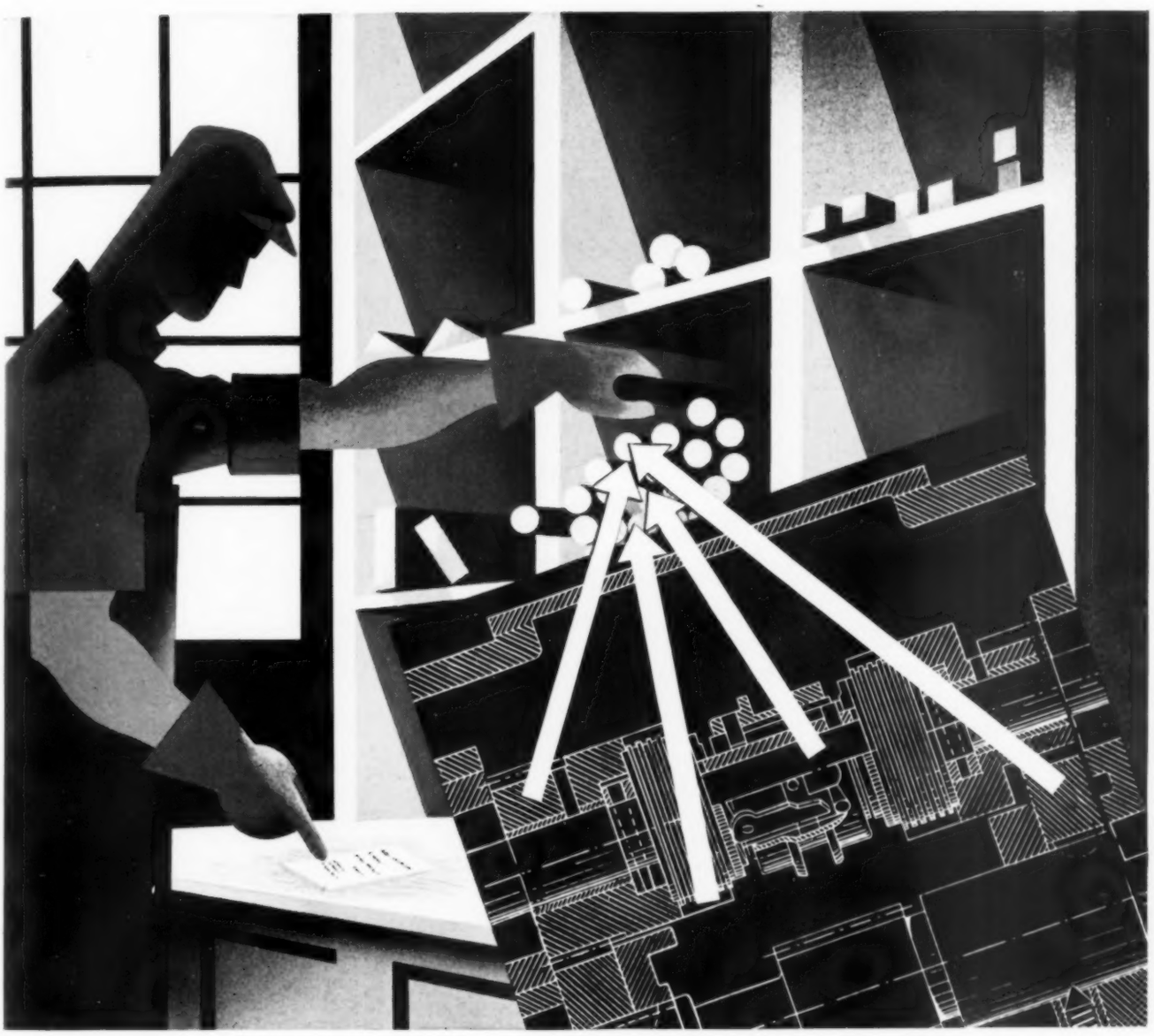

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Climax Mo-lyb-den-um Company

MOLY

(*Continued from page* 60)

process, declaring that silica sand is used at the Birdsboro plant and that the higher the silica in the sand the better. Mr. Post said they treat the patenrs with an acetone paint.

He indicated that while more time is necessary in the molding, this loss is more than offset by the saving in the cleaning department, adding that they had been many times successful in obtaining work, where speedy delivery was a prime consideration. Mr. Post said that on gear work and other precision castings they have had no difficulty in obtaining dimensional accuracy down to one thirty-second of an inch. —*B. K. Price.*

Chicago

JOB Evaluation and Piece Rates" was the discussion subject at the monthly meeting of the Chicago chapter, American Foundrymen's association, May 9. Attendance was approximately 125. This subject was presented by H. C. Robson, industrial engineer, Continental Roll & Steel Foundry Co., with C. E. Westover, Burnside Steel Foundry Co., acting as technical chairman.

Mr. Robson presented a plan for classifying various jobs according to their requirements. Various weights are allocated to the different requirements, with the sum of these weights indicating the rating which sets the hourly pay.

Different factors making up the weight classification include: Schooling; training, according to length of service; skill, including not only manual dexterity but also judgment and memory; responsibility, including the necessity of supervision and the responsibility involved for the cost of product or equipment; physical requirements; working conditions of the plant; hazards to health and accidents; and use of experience.

In using this method of evaluating a job it is necessary that the opinion of several supervisors be averaged in selecting the weights considered most applicable to the particular job under consideration. Mr. Robson recommended that job evaluation precede time and motion study. In the case of molding operations it was suggested that standdards be set for each component part of the operation after time studies have been made.

Various advantages are claimed for the establishment of standards for various jobs and operations. Not only is a more effective control of costs provided but an incentive is given to workers to improve their practice, with a resultant betterment in efficiency and reduction in costs.

Nominations for officers of the Chicago chapter for the 1938-39 year were presented at the May meeting and include the following nominees: Chairman, L. H. Rudesill, Griffin Wheel Co.; vice chairman, C. E. Westover, Burnside Steel Foundry Co.; treasurer, C. C. Kawin, Chas. C. Kawin Co.; secretary, L. L. Henkel, Interlake Iron Corp.

The following were nominated for directors: H. Kenneth Briggs, Western Foundry Co.; J. J. Fox, Wisconsin Steel Co.; W. C. Packard, National Engineering Co.; G. P. Phillips, International Harvester Co.; A. W. Weston, Chicago Hardware Foundry Co.; and H. W. Johnson, Greenlee Foundry Co.

The annual awards of the Chicago chapter to student winners in the Illinois Vocational association's molding contest were presented to the following: George Soiya, Lindbloom high school, winner of the contest; Elmer Olson, Lane Technical high school, second place; and Arthur Ender, Lindbloom high school, third place.—*W. G. Gude.*

Quad City

QUAD CITY chapter of the A. F. A. held its regular meeting April 18 at the Fort Armstrong hotel, Rock Island, Ill., with 110 present, including visitors from the Northern Iowa Foundrymen's association and from St. Louis, Chicago, Rockford and Peoria, Ill.

P. T. Bancroft, chairman of the chapter, presided. A. E. Hageboeck of the nominations committee reported the nominations as follows: M. J. Gregory, Caterpillar Tractor Co., Peoria, chairman; H. A. Deane, Deere & Co., Moline, vice chairman; J. Morgan Johnson, Moline, secretary-treasurer. The board of directors is as follows: P. T. Bancroft, H. Bornstein, T. J. Frank, J. H. Ploehn, A. E. Hageboeck, F. O. Gorman, H. F. Henninger, W. O. McFatridge and Clyde H. Burgston.

Gust Olson Jr., John Deere Tractor Co., Waterloo, Iowa, gave an interesting talk on "Foundrymen in a Changing World." Mr. Olson introduced his speech with a brief history of the foundry industry and presented many illustrations of early methods of casting metals. The speaker cited changes in the industry and showed that machining tools for machining, properties of products made, new equipment developed and division of the foundry into important departments were the leading changes. Mr. Olson stressed the need for co-operation between the various departments and safety and good housekeeping in the plant so that products of suitable quality and quantity may be produced at reasonable cost. He said that with the many changes in the world of industry the foundryman must keep up with the changes in potential and real markets. Many contributions on the topic of these changes came from the group and the discussion was lively and interesting.—*J. Morgan Johnson, secretary-treasurer.*

Pittsburgh

NOMINATING committee of the Pittsburgh Foundrymen's association announced the nomination of the following for officers for the fiscal year beginning July 1, 1938, at the regular April meeting: President, O. Naddlny, Duquesne Pattern & Bronze Co.; vice president, J. H. Johnston, Westinghouse Electric & Mfg. Co.; secretary-treasurer, C. H. Paul, Mackintosh-Hemphill Co.; members of the executive committee, H. P. Spilker, Sterrett-Thomas Foundry Co.; T. A. Reynolds, McConway & Torley Corp.; W. H. White, Pittsburgh Rolls Corp.; R. C. Heaslett, Continental Roll & Steel Foundry Co.; H. M. Wilson, Taylor-Wilson Mfg. Co.

As speaker for the nonferrous session held at this meeting, R. J. Keeley, chief metallurgist, Ajax Metal Co., Philadelphia, talked on "Some Problems Encountered in the Nonferrous Foundry." Basing the paper on specific cases, Mr. Keeley showed how problems were solved by actual experiences and methods. Most problems arise from three general sources, according to Mr. Keeley—selection of metals not suited for the use for which the castings were intended, faulty foundry practice and improper melting methods.

Two classifications of corrections are in general used. First and most common is a close inspection of the casting and study of the melting procedure which usually will show up the cause of the defect to an experienced investigator. When this procedure fails, a process of elimination may be used which begins with the setting up of standard foundry practice and subsequent elimination or revision of each of the various factors involved in casting production until the division at fault is located. A close study of this division accompanied by careful experimentation usually will show up the spot which is at fault.

Many problems arising from excess hardness in brass and bronze castings may be traced to an excessively high phosphorous content, usually arising from the use of phosphor copper in deoxidation. In some cases this has arisen as a result of melting too much secondary metal and gates which contain phosphor copper together with the standard amount of phosphor copper with the prime metal used in the mixture.

Improper operation of melting equipment is also prone to cause

(*Continued on page* 66)

IN THIS SWIFT AGE SAVE YOURSELF TIME AND WORRY ON METALLURGICAL PROBLEMS!

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We are experts in the manufacture of Non-Ferrous Ingot Metals—backed by fifty eight years' experience; and we gladly offer Ajax Service, therefore, which means expert advice on your foundry problems and in the selection of a formula best suited for the purpose intended.

Ajax 7 Point Ingot Metals are as pure and fine as the most modern scientific knowledge and equipment can produce; and their regular use in your foundry will insure a maximum number of perfect castings at the lowest possible cost.

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THE AJAX METAL COMPANY

Established 1880

PHILADELPHIA

NEW YORK—CHICAGO—CLEVELAND

(*Continued from page 62*)

difficulty in melting brass or copper. Use of too many fluxes or improper use of fluxes is another cause cited by Mr. Keeley. Oxidation of the metal was given as another cause of difficulties.—*R. L. Hartford.*

New England

APPROXIMATELY 50 members and guests of the New England Foundrymen's association were present at the regular monthly meeting which was held at the Engineers club, Boston, on May 11. J. Chandler Crandell, Scovell-Wellington & Co. Boston, and chairman of the commission that drafted the Massachusetts state social security laws spoke on "Problems of Social Security Taxes as Affecting Industry."

In discussing Title VIII which relates to the federal old age pension, he summarized the provisions as follows: It applies to all employers of one or more employes under 65 years of age. Employer and employe contributions are the same, and those constitute 1 per cent of the yearly wage up to $3000 annually for 1937, 1938 and 1939; 1½ per cent for the years 1940, 1941, and 1942; 2 per cent for 1943, 1944, and 1945; 2½ per cent for 1946, 1947 and 1948, and 3 per cent thereafter.

He then explained other features on methods of payment to the worker on retirement stating that the minimum monthly pension is $15 and the maximum $85. Title IX refers to federal unemployment insurance which Mr. Crandell explained is a state plan conforming to government regulations, but may be individual with the state. Tax is collected from employers of 8 or more, and is 3 per cent for 1938. Employes contribute 1 per cent of their wages per year. The state gets credit for 90 per cent of the tax if it has conformed to government recommendations; remainder going to the federal treasury. So far 51 states and territories have conformed to such laws. Several changes in the law have been suggested to the state legislature such as making it apply to employers of 4 or more, and paying of benefits for 20 weeks instead of the present 15 weeks.

Following the discussion at which the speaker endeavored to explain many of the complicated features of these laws, he showed some very interesting colored motion pictures taken in his extended travels around the world.—*M. A. Hosmer, A.F.A. representative.*

Northern Illinois

MAY meeting of the Northern Illinois Foundrymen's association was held at Hotel Hilton, Beloit, Wis., with 85 members and guests present. Name of the group was changed to Northern Illinois and Southern Wisconsin Chapter of the A.F.A. New by-laws were adopted, and officers elected for the ensuing year include: Chairman, John Clauson; vice chairman, G. J. Landstrom; technical secretary, H. C. Winte; secretary-treasurer, G. K. Minert; directors for 3 years, C. M. Dale, H. F. Halverson, and P. A. Paulson; director for 1 year to fill unexpired term of H. S. Bennethum, Eli Johnson. The picnic committee reported that an old fashioned foundrymen's picnic will be held June 4 at Svithiod park on Rock river, south of Rockford, Ill.

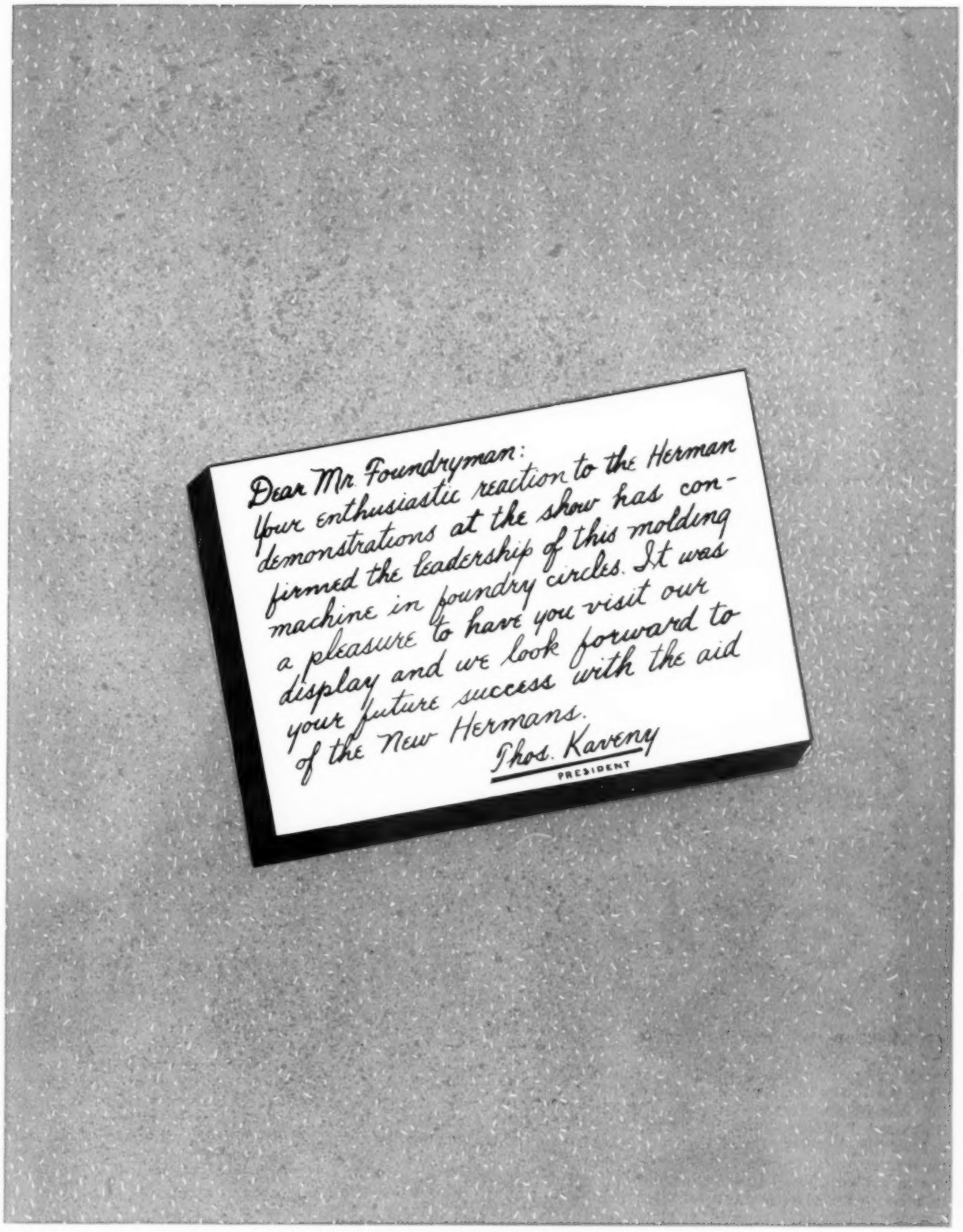
H. L. Campbell, American Hoist & Derrick Co., St. Paul, Minn., gave an instructive and interesting talk on foundry core practice. He described the characteristics of core materials and their effect on physical properties; reactions taking place in baking and temperatures required for different binders. After mentioning hazards encountered in using cores in green sand molds, he summarized the talk as follows: Establish standard core sand mixtures based on experience and experiment. Purchase core binders on basis of results produced. Use as coarse and uniform core sand as is consistent with finish desired on castings. Measure materials accurately. Use sufficient water with water-soluble binders to develop maximum green sand strength. Set core made with water-soluble binders last. Do not use fillers to obtain fineness on surface of castings. Eliminate wires and rods unless necessary. Do not leave cores in moist atmosphere; make permeable cores.—*Lawrence Perry, technical secretary.*

Northern California

A NUMBER of foundrymen and their ladies from the Northern and Southern districts gathered at Fresno in April to meet with those of the Central Valley, in what promises to be an annual event. M. G. Wilson, Wilson & Nutwell, Fresno, was host chairman, and after welcoming the 77 guests and stating the purpose of the meeting,

(*Concluded on page 68*)

Following the close of the regional foundry conference held at Massachusetts Institute of Technology, April 8 and 9, the foundry equipment and supply representatives in the New England district held a foundrymen's smoker and dinner at Lenox hotel, Boston


Dear Mr. Foundryman:
Your enthusiastic reaction to the Herman demonstrations at the show has confirmed the leadership of this molding machine in foundry circles. It was a pleasure to have you visit our display and we look forward to your future success with the aid of the New Hermans.
Thos. Kaveny
PRESIDENT

MOLDING **HERMAN** MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Concluded from page 66*)

he turned the gavel over to Charles Hoehn, Enterprise Foundry Corp., San Francisco, and chairman of the Northern California chapter.

C. B. Tibbetts, Los Angeles Steel Casting Co., Los Angeles, spoke on foundry costs, and Wendell Kinney, Kinney Iron Works, Los Angeles, talked on the seriousness of scrap exportation. Judge Sylvester J. McAtee, San Francisco, discussed the coke tax. Robert Gregg, Reliance Regulator Corp., Los Angeles, and chairman of the Southern California chapter, stated that the chapter now has 114 members and that 38 were planning to attend the Cleveland convention of the A.F.A. Fred Twinning, Twinning Laboratories, Fresno, a new member also spoke.

Following adjournment of the meeting an executive committee of 14 decided to hold similar meetings about the middle of each year at Fresno; appointed committees to look into exportation of scrap metals; adopted a resolution recommending the foundrymen of the north and south confine operations to their respective territories, and retain Judge McAtee to carry the coke case to the California state board of equalization. George L. Kennard, San Francisco, was appointed treasurer of the fund to bear the expenses of such work.

May meeting of the Northern California chapter was held at Athens Athletic club, Oakland, Calif., on May 13. A motion picture film on safety entitled, "Lady Luck's Husband" was presented which was amusing as well as instructive. William E. Worth was the speaker of the evening and talked on the use of temperature recording instruments which were available for inspection. John Fenstermacher, Columbia Steel Co., San Francisco, and vice chairman of the chapter presided.—*George L. Kennard, secretary-treasurer.*

Reading

ONE of the best attended meetings of the Reading Foundrymen's association was held on April 19 at the Wyomissing club, Reading, Pa., with 33 members present. H. F. Scatchard, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., gave an extremely interesting talk on use of cement-bonded molding sand in steel, gray iron and nonferrous foundries. Illustrating his discussion with slides and motion pictures, the speaker pointed out that the Randupson process has many advantages including dimensional accuracy due to freedom from mold warpage and distortion because artificial drying is not used; clean surface, and accurate pattern outline, etc.

Molds and cores can be made by the conventional drag-cope method, with core boxes, or by sections. No flasks are required except on larger jobs since simple boxes or forms are sufficient. Little nailing is needed on steel castings; no nails on small iron jobs, and but few nails on corners and fillets of large iron jobs.

After the regular meeting the executive committee met to discuss the possibility of holding a foundrymen's picnic during the month of June at the Manor Country club, and the secretary was instructed to obtain the necessary information.—*H. C. Cummings, secretary.*

Northeastern Ohio

NORTHEASTERN Ohio Chapter of the A.F.A. will hold its annual golf outing at Lake Forest Country club, Hudson, O., June 25. The course will be available all day, and a dinner will be served in the evening. Information on tickets can be secured from John H. Tressler, Hickman, Williams & Co., Union Commerce building, Cleveland.

Connecticut

MEETING of the Connecticut Foundrymen's association was held April 22 at Craig Loch, Meriden, Conn. President George R. Holmes presided. Appointment of two committees was as follows: Henry Griggs, Waterbury Farrell Foundry & Machine Co., Waterbury, Conn., chairman of the nominating committee; Fred Fromm, Manufacturers Foundry Co., Waterburw, and Edgar Spencer, Philbrick-Booth & Spencer Inc., Hartford, Conn., members of the nominating committee; Gilbert I. Drysdale, Plainville Casting Co., Plainville, Conn., chairman of the outing committee; Stanley Bullard, Bullard Co., Bridgeport, Conn.; Henry Griggs, Waterbury Farrell Foundry & Machine Co., Waterbury, and Norman Stringer, Charles Parker Co., Meriden, members of the outing committee.

Marshall Post, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., gave a very enlightening talk supplemented by numerous slides on the use of cement bonded molding sand as developed under the Randupson process for ferrous and nonferrous castings. He said that proper use of this type of sand for cores and molds can result in considerable saving in the production of large castings as well as better quality of product.

In this system flasks and drying ovens are eliminated. The molds are rammed up in wooden frames, in sections on particularly large jobs. They are then airdried for 72 hours. After sufficient drying these sections are strong enough to support their own weight and can be handled easily by cranes. Less gas is generated in pouring; the use of nails for securing molds and cores is eliminated and uniform ramming is not necessary. The sand does not deform in drying, said Mr. Post, and a casting shape true to that of the pattern is produced.

Conn. Nonferrous

CONNECTICUT Nonferrous Foundrymen's association will hold its fifth annual entertainment on June 17 at Wilcox Pier restaurant, West Haven, Conn. Fred B. Clarke, chairman of the entertainment committee has arranged an excellent program — *Louis Tarantino, secretary.*

Buffalo

REGULAR meeting of the Buffalo chapter was held May 2 at King Arthur's restaurant with T. H. Burke, chairman, presiding. Sixty members and guests were present to hear Lester B. Knight Jr., National Engineering Co., Chicago, give an interesting talk on reclaiming, handling and conditioning foundry sands. He illustrated his talk with numerous steroptican slides. After the address, the meeting was open for discussion, and many interesting points were brought out. Annual election of officers of the chapter will take place in June.—*J. R. Wark, secretary.*

Philadelphia

THE Metropolitan Philadelphia chapter closed its session with a visit to the General Steel Castings Corp., Eddystone, Pa. Following a luncheon, 138 members and guests made a tour of the plant, and had an opportunity to see a modern steel castings plant in operation. From the plant the group proceeded to the El Rancho club for dinner. After the dinner William M. Sheehan, General Steel Castings Corp., presented a paper on, "Steel Castings, Their Past, Present, and Future." A lively discussion followed, and the questions were answered ably by Karl S. Howard, works manager of the same firm.

During the meeting Chairman Henszey announced that the following officers had been duly elected for the coming year: Chairman, Harold Henszey; vice chairman, W. C. Hartman; secretary- treasurer, William B. Coleman; board of directors, L. W. Harris and J. H. Spencer, and advisory board, A. W. Bowman, and C. H. Schley.—*J. T. Fegley, chairman of publicity committee.*

ADVERTISING MATTER REMOVED

H. Bornstein

H. S. Hersey

F. A. Lorenz Jr.

D. O. Thomas

A.F.A. Elects Five Directors

ELECTION of five board members of the American Foundrymen's association, was announced at the annual business meeting held Wednesday, May 18. The directors are as follows: Hyman Bornstein, H. S. Hersey, F. A. Lorenz Jr., George A. Seyler, and David O. Thomas.

Hyman Bornstein

HYMAN BORNSTEIN, retiring president of the A.F.A. and director, testing and research laboratories, Deere & Co., Moline, Ill., was born in Chicago in 1891. He attended Armour Institute of Technology from which he received a bachelor of science degree in chemical engineering in 1911, and in 1915 he graduated from John Marshall Law school, Chicago. After serving as chemist for the Union Pacific railroad and later for Swift & Co., Chicago, he became chemist for the city of Chicago, resigning that position to serve as a captain in the ordnance department at the outbreak of the World war. After the war he became affiliated with Deere & Co. Mr. Bornstein served previously as a director of the A.F.A. from 1932 to 1935. He is a member of the American Chemical society, American Institute of Mining and Metallurgical Engineers, American Society for Testing Materials and American Society for Metals.

H. S. Hersey

HERBERT SHERMAN HERSEY was born in Montreal, Que., on Sept. 22, 1883. He received his entire education in Montreal, attending public school, Montreal Collegiate institute, Ward-Whaites academy and McGill university. He received his early training in the mechanical arts in the plant of Pillow & Hersey Mfg. Co., Montreal, where he became head of the department for manufacture of railroad track bolts, nuts and spikes. Later he entered the employ of Dodge Mfg. Co. of Canada Ltd., Montreal, as sales engineer and advanced to the position of manager at Montreal. Mr. Hersey became associated with the C. O. Bartlett & Snow Co. in 1912 as its Canadian representative. In 1915 he came to the company's principal plant and office at Cleveland and has been active in the company since that time, at present serving as vice president and general manager. Mr. Hersey recently was elected president of the Foundry Equipment Manufacturers' association.

F. A. Lorenz Jr.

F. A. LORENZ JR., vice president, American Steel Foundries, Chicago, was born Feb. 26, 1886, in Lansing, Mich. Since becoming associated with American Steel Foundries in 1911, Mr. Lorenz has served as manager of sales, Davis wheel division; works manager of the plant at Indiana Harbor, East Chicago, Ind.; assistant vice president in charge of operations and general manager of the Indiana Harbor and Pittsburgh plants of the company. He has been president of the Steel Founders Society of America since 1934, served on the Durable Goods Industries committee in 1934, is director of the American Management association and in 1934 was president of the Midwest Marketing society, Chicago.

G. A. Seyler

David O. Thomas

DAVID O. THOMAS was born in Johnstown, Pa., Nov. 22, 1882, the third in line of a family of iron workers. He attended the public schools of Alliance, O., and in 1898 began his career with Johnson Steel Co., Lorain, O. Mr. Thomas then worked in the machine shop of Wellman-Seaver-Morgan Co., Cleveland, until 1904 when he became clerk for the Sharon Foundry Co., Sharon, Pa. He then went to the National Malleable Castings Co., Sharon, to work as a core maker, molder and inspector for a short time before joining the Driggs, Seabury Ordnance Corp., Sharon. He became connected with General Motors Corp. in 1912 and in 1923 he was made assistant general manager of Saginaw Products division, General Motors Corp. From 1925 to 1930 he was general manager of the Saginaw Malleable Iron division which position he held until recent-

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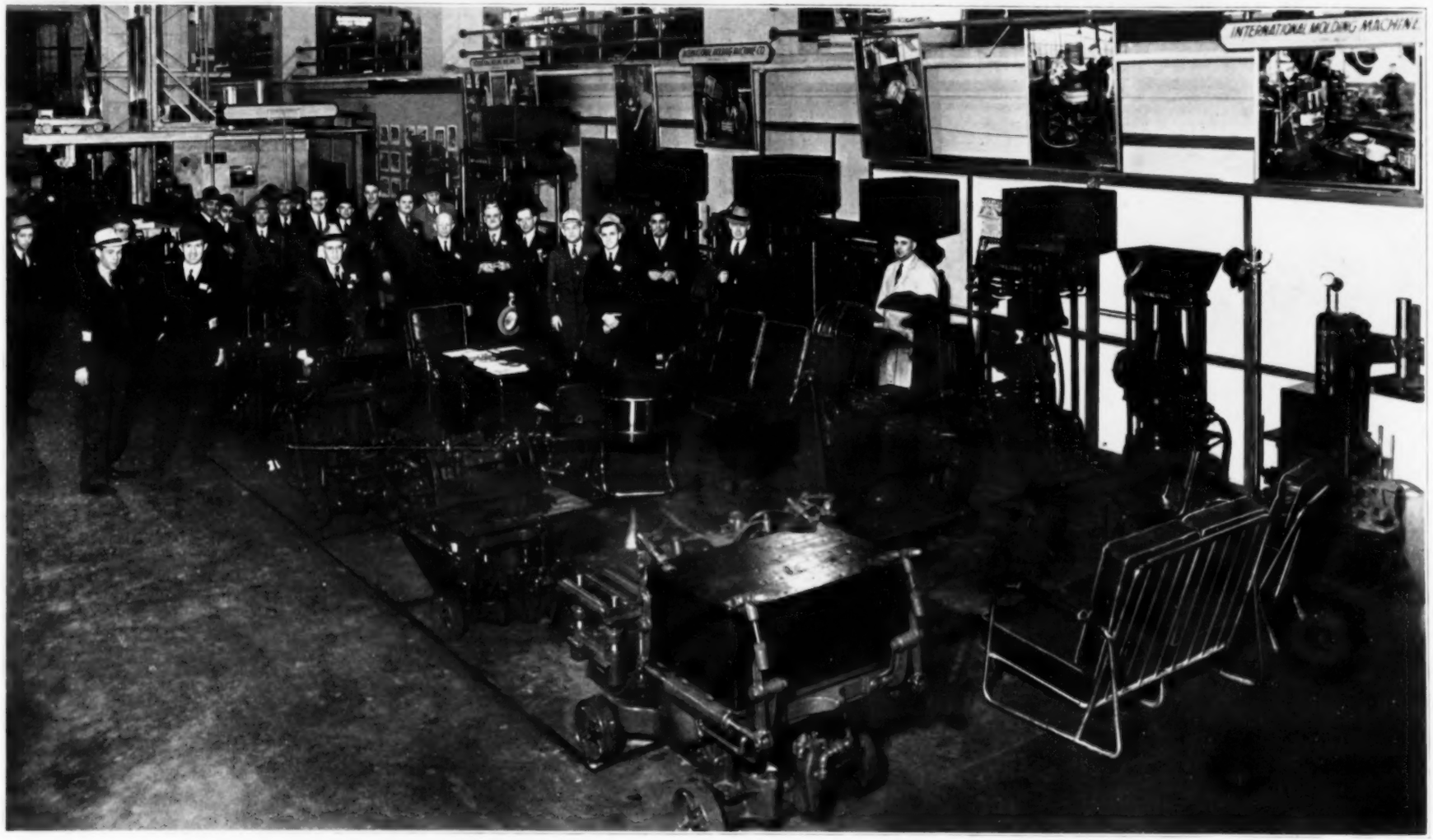

INTERNATIONAL MOLDING MACHINE CO.'S representatives and a few friends who have called to inspect the 25 different types of **INTERNATIONAL** machines on display at the A. F. A. Convention.

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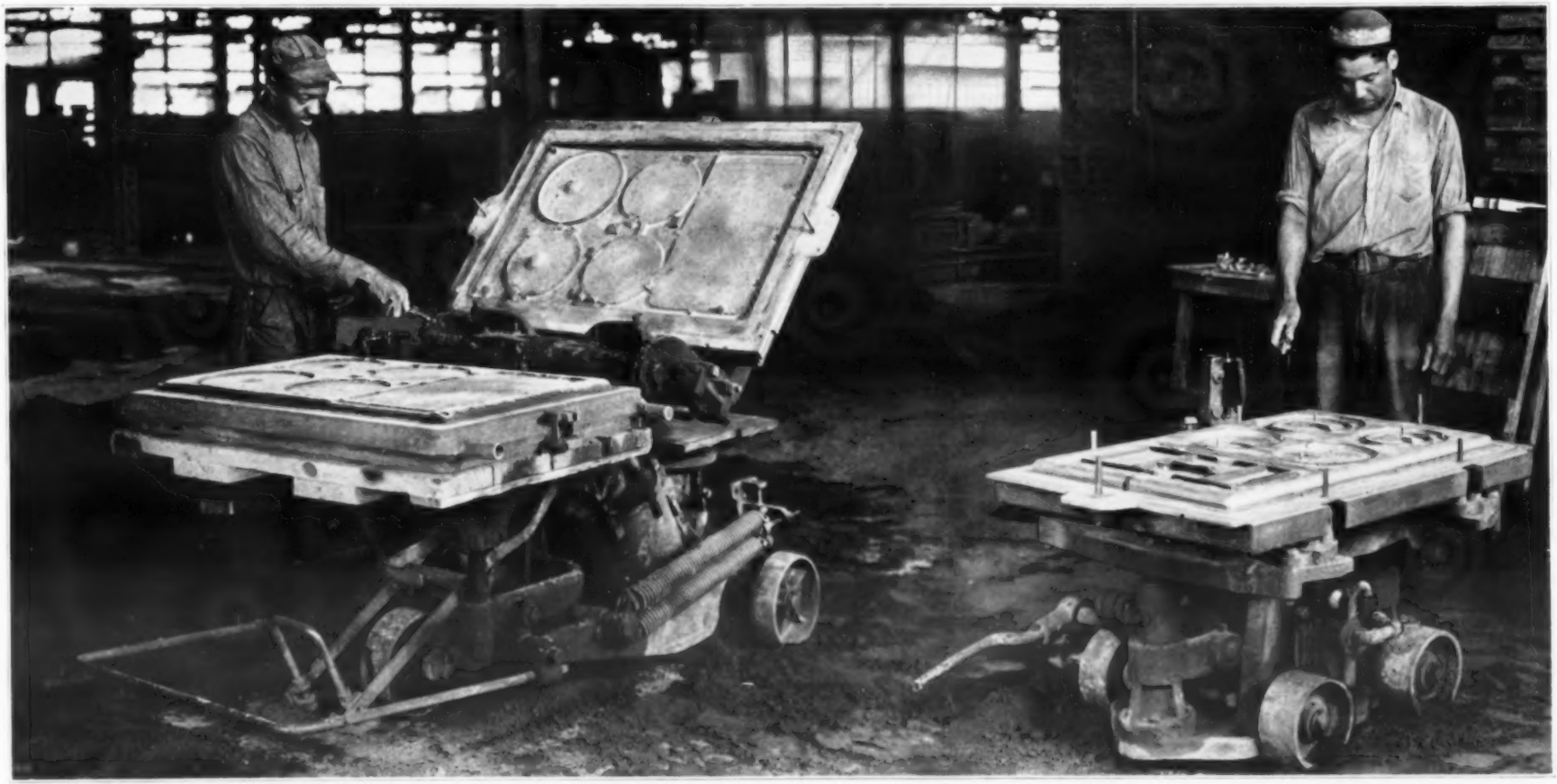

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ly when he became vice president of the Bendix Aviation Corp., South Bend, Ind., a General Motors Corp. affiliate.

George A. Seyler

GEORGE A. SEYLER is works manager and director, the Lunkenheimer Co., Cincinnati. Mr. Seyler has taken an active interest in the work of various associations, being president, Industrial Association of Cincinnati; director, Ohio Mechanics institute; and a member of the administrative council of the National Founders' association and the National Metal Trades association.

Castings Discussed By Engineers

A session dealing with foundry metals featured the national meeting of the Machine Shop Practice division, American Society of Mechanical Engineers at the Sagamore hotel, Rochester, N. Y., May 10-12. This session was arranged and sponsored by the American Foundrymen's association and was conducted under the chairmanship of Dan M. Avey, secretary-treasurer of the association, Chicago. Three papers were presented and dealt respectively with physical properties and engineering applications of steel castings, gray iron castings and malleable iron castings.

Raymond L. Collier, secretary, Steel Founders' Society of America, Cleveland, and H. J. Shiffli, production engineer, American Steel Foundries, Chicago, jointly presented the steel castings paper prepared by F. A. Lorenz Jr., vice president of the latter company. A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland, discussed gray iron; and Enrique Touceda and J. H. Lansing, consultant and shop practice engineer, respectively, Malleable Founders' society, Cleveland, jointly dealt with malleable iron.

The steel castings paper was concerned chiefly with the factors which determine proper and economic uses of castings and welded construction. Mr. Lorenz made it clear that use of castings or welding should not be regarded as competitive but as complementary. Each has its legitimate field, but each has had its misapplications. In many instances, he said, proper combination of the two results in structures which render superior service.

Speaking on behalf of gray iron, Mr. Denison maintained that engineers are not appreciating fully the advantages of the high-strength irons developed in recent years. Most of these irons contain alloying elements and precise foundry control assures castings which are sound and entirely capable of performing extreme service. In addition to high strength and other physical properties which Mr. Denison stressed were resistance to wear, corrosion and high temperatures; damping effect; low deflections under load; and response to heat treatments, including flame hardening.

Dr. Touceda traced the development of malleable iron over many years to the present-day, high-quality product. This development has led to establishment of most acceptable specifications, and the material thereby has been made available for a widening field of applications. Properties which the speaker stressed were shock resistance, toughness and ease of machining. Mr. Lansing's portion of the paper pointed out many of the applications in which malleable is showing excellent service.

Book Review

The Pneumonokonios (silicosis) Literature and laws, Book III, by George G. Davis, Md., Ella M. Salmonsen, and Joseph L. Earlywine, 1033 pages, published by the Chicago Medical Press, Chicago, and supplied through THE FOUNDRY for $8.50 and in Europe by the Penton Publishing Co. Ltd., London.

The first part of this volume includes abstracts of articles on silicosis published during 1935 and 36 in the United States and foreign countries. Part II consists of the occupational disease laws pertaining to pneumonokonioses (silicosis) now in force in the United States and in several foreign countries.

This volume follows Books I and II covering literature and information prior to 1934 and the material presented during 1934 respectively.

Medical index is included for physicans, medical students, medical librarians and medical technicians. This is followed by a subject index which should be of practical value to industrial physicians, and hygienists, as well as to attorneys, insurance carriers and the general reader. An author index also is included, as is a bibliography not previously available in Books 1 and II.

With widespread interest in the silicosis problem, this book should prove valuable to many in the foundry industry.

Map of the iron and steel works of the United States has been published by J. H. H. Muirhead, civil engineer, 230 West 108 street, New York. The map is based on the *Iron and Steel Works Directory* and can be purchased in various sizes and forms.

Virginia Provides Apprentice Plan

A law recently was passed in Virginia providing for a system of voluntary apprenticeship. The act makes the commissioner of labor responsible for its administration. It provides for the appointment by the governor of an apprenticeship council consisting of three representatives each from employer and employe organizations respectively. The state supervisor of trade and industrial education and the commissioner of labor are ex-officio members of the council without vote.

The apprenticeship council, in cooperation with local and state joint apprenticeship committtees, is authorized to determine standards for apprenticeship agreements; to approve apprenticeship agreements which meet the standards established by the act; to terminate apprenticeship agreements in accordance with the provisions of the act; to keep a record of apprenticeship agreements; to issue certificates of journeymanship upon completion of apprenticeship; and to appoint local and state joint trade apprenticeship committees.

Northwest Minerals

Under the general title, "Market for Columbia River Hydroelectric Power Using Northwest Minerals," by E. T. Hodge, the War department, office of the division engineer, North Pacific division, 523 Pittock block, Portland, Oreg., has published several volumes discussing uses and technology of various ores, their deposits in the Northwest, possible electric power applications, etc. One of the volumes relates to magnesia, and is in two sections. It is entitled "Section I—Northwest Magnesia Ores," and the price is $3.75. Another volume entitled "Section II—Northwest Silica Materials" is in two volumes, and the price is $3.75. The third, "Section III—Northwest Limestones," also is in two volumes, and the price is $7.

Move Offices

Sullivan Machinery Co. has moved its general offices from 307 North Michigan avenue, Chicago, to Michigan City, Ind. where one of its plants is maintained. Another plant is located in Claremont, N. H. and additional manufacturing facilities are provided in Dundas, Ont., and Grantham, England.

Easton Car & Construction Co. has moved its New York office to Hudson Terminal, 50 Church street. The office will be managed by Alfred L. Schuller.

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He knows his stuff! — But he can't do top-notch work with obsolete flasks.

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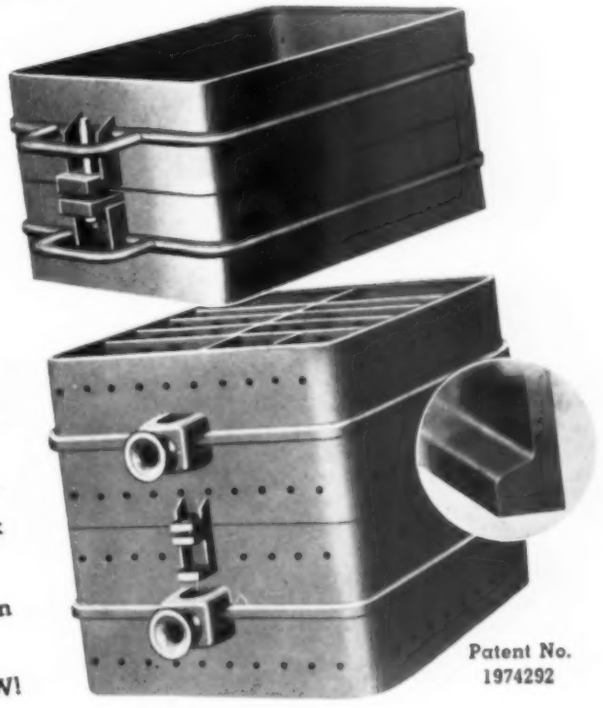

Patent No. 1974292

STERLING WHEELBARROW CO.

7100 W. WALKER STREET
MILWAUKEE, WISCONSIN

Industry Gains Confidence Through Convention

(*Continued from page 29*)

colds and other respiratory diseases were more susceptible to fibrosis and silicosis. Hence, such workers should not be exposed to any dust hazard. He also said he believed that further study of the various problems might result in methods of picking the man for the job, rather than the present other way about.

Over 100 attended the session on patternmaking which was held Monday afternoon under the direction of Vaughan Reid, City Pattern Works, Detroit, chairman and H. M. Harrold, Caterpillar Tractor Co., Peoria, Ill., vice chairman. Edward Hynan, Saginaw Malleable division, General Motors Corp., Saginaw, Mich., presented the first paper which described in detail pattern developments and molding methods as practiced in his firm's plant. He stated that during the past 20 years the most important development was the transfer of small hand plates to machine equipment. Also improvement in molding machines enabled running nearly all heavy production jobs on them.

Metal for Pattern Plates

Machine patterns were developed to a point where most jobs can be operated as drop plates, doing away with rollover and stripper frame types. Due to the severe service required of pattern plates, the firm has developed an alloy iron for patterns containing 24 per cent chromium, 2 per cent carbon, 1 to 2 per cent silicon, and 0.75 per cent manganese. The material can be machined to size, heat treated and quenched with minimum expansion and distortion. Also a bronze alloy containing 80 per cent copper, 12 per cent tin, 4 per cent lead and 4 per cent zinc was developed for pattern use.

In the discussion some one asked for information on the possibility of cores tearing through the use of narrow brass strips on the outline of core boxes as practiced at the Saginaw plant. The speaker said no difficulty was encountered since the strips were fitted exactly to the contour. Another inquired whether brass strips possessed any advantage over steel strips. The reply was that steel strips probably will work just as well, since brass just happened to be selected.

B. B. Wittfoht, Caterpillar Tractor Co., Peoria, Ill., and chairman of the committee for the development of standards of patternmaking apprenticeship, presented an interesting tentative report which included detailed information on all phases of the subject. Not only does the report cover the instruction to be received, but also the administration, selection of apprentices, agreement, tools required, and records to be kept. The committee recommends indenture of apprentices, and a 4-year course.

E. T. Kindt, Kindt-Collins Co., Cleveland, spoke on modern pattern production, and said that hand work is expensive. He pointed out that the pattern department is a key department. For a pattern maker to be successful he must be progressive and must have, in addition to ability as a mechanic, ability in business and sales. He also must be conversant with modern foundry and machine shop practice.

In his talk Mr. Kindt mentioned a new plaster which is 3 times as strong as a good grade of dental plaster, and is much more wear resistant. In answer to a question on sand sticking to wood patterns, he stated that arsenic in shellac had a detrimental effect on drying. He said a new type of shellac free from arsenic dried hard enough in 15 minutes to be sanded. High humidity in summer caused water to be absorbed by shellac solutions, and must be avoided by making up only small amounts, using a good grade of alcohol, and employing a clean pot.

He advocated separation of wood and metal pattern shops to keep them cleaner. One speaker said that in training patternmakers, it was well worth while to give both metal and wood experience, and then the men could be shifted from one type to the other as work required.

Cover Several Phases of Gray Iron Practice

GRAY iron practice featured sessions on Monday and Tuesday. Two papers were presented at the session presided over by James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., as chairman, and A. W. Weston, Chicago Hardware Foundry Co., Chicago, as vice chairman. Both papers were connected to the extent that they covered various phases of one general subject, the enameling of cast iron. The first paper "Hints on the Molding and Preparation of Castings for Enameling" was presented by R. B. Schaal, Ferro Enamel Corp., Cleveland. As the title indicates, the paper falls under the heading of practical as compared with the second paper "The Relation of Microstructure to the Enamelability of Cast Iron" which theorizes to a certain extent and indicates that much investigation will be required before it will be safe to generalize on the relation of microstructure to enamelability. This paper was presented by G. H. Spencer-Strong, Porcelain Enamel & Mfg. Co., Baltimore.

Following a brief introduction touching on enamel as one of the most beautiful, useful and practical finishes for cast iron parts, Mr. Schaal directed attention to the influence of design, sand, molding and casting features on the success of the finished product. Accuracy of dimension with proper clearances and tolerances are fundamental requirements. Matchplates decidedly are preferable to loose patterns. The author referred to the fact that large flat surfaces are difficult to

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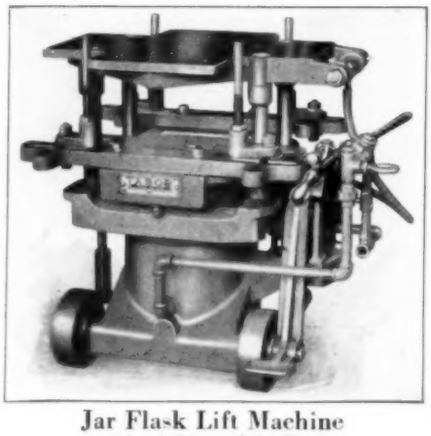
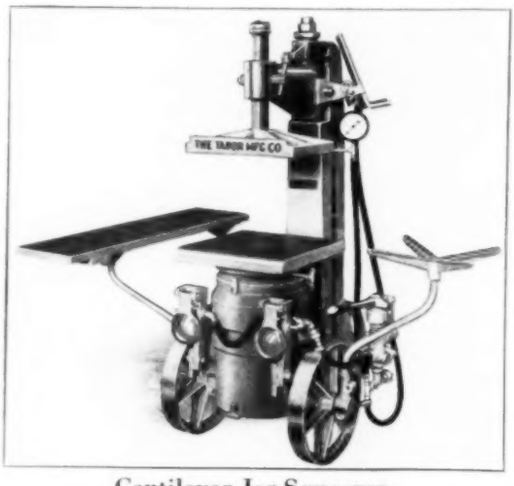
These machines have SHOP APPEAL



Jar Flask Lift Machine with Adjustable Pins

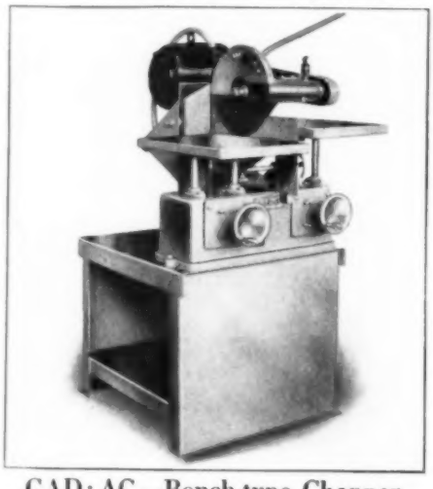
Jar Squeeze Drop-Plate Machine

Jar Rollover Pattern Draw Machine



Cantilever Jar Squeezer

. . . outstandingly practical machines for practical Foundrymen . . . This was definitely demonstrated by the enthusiastic interest shown in the Tabor exhibit at the Convention . . .



GAD: AC—Bench-type Chopper Adjustable Table

MOLDING MACHINES

CUPOLAS LADLES

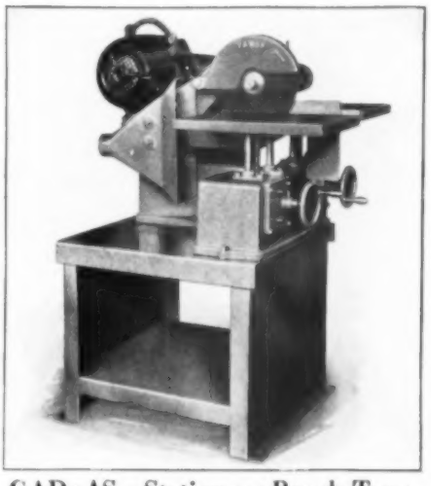
SAND BLASTS TUMBLERS

DUST COLLECTORS

CORE ROOM EQUIPMENT

BRASS FOUNDERS' EQUIPMENT

ABRASIVE CUT-OFF MACHINES



GAD: AS—Stationary Bench Type Adjustable Table

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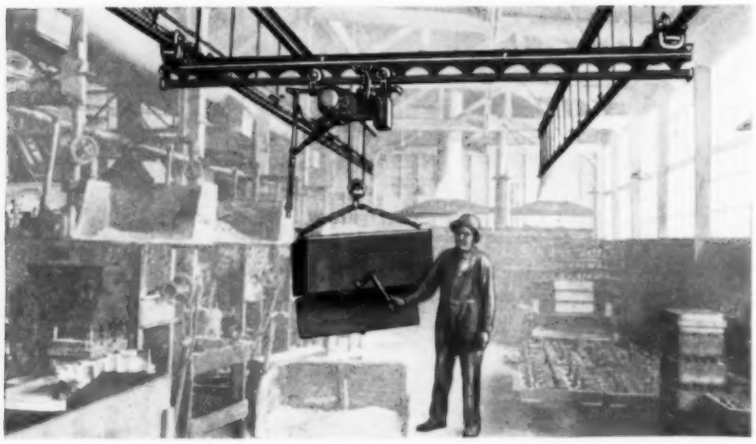

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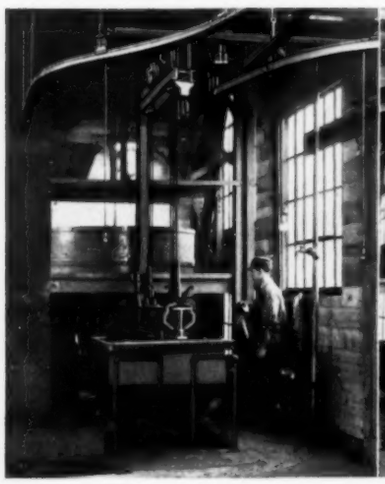

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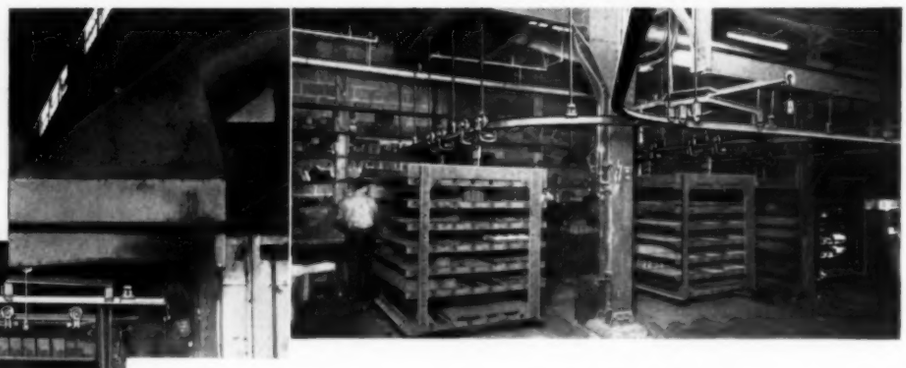

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(*Continued from page 76*)

enamel principally because of the difficulty in securing a uniformly clean surface on the casting and a homogenous metal structure. On the subject of design he showed two illustrations contrasting a suitable and an unsuitable corner design on a casting. Sharp corners should be avoided since the enamel will not remain on the thin line. Gradual curves should be substituted for corners.

After a suitable design has been developed all factors conducive to warpage and buckling in the enameling furnace should be considered and suitable precautions taken to prevent the formation of hair lines, poor fit, and blistering. A considerable part of the paper was devoted to the subject of sand and the properties required in this material for making molds for castings to be enameled. The speaker did not favor the use of graphite facing on the molds. As an extreme instance he quoted some foreign practice where graphite facing is employed to impart perfectly clean, smooth skin to the castings. However, the castings must be annealed before they can be enameled.

In the paper by G. H. Spencer-Strong the author discussed the relation of the microstructure of enameling iron to the enamelability as concerned with the four major enameling defects caused by the iron, blistering, hair lining, poor adherence and warping. Blistering is the most prevalent defect. Effect of iron oxide, chill structures, inclusions and blow holes and of the effects of graphite, free carbon and the decarburization of pearlite were discussed in considerable detail.

Discuss Plain and Alloy Irons

A capacity audience of 200 attended the second session on gray cast iron on Monday afternoon at which four papers were presented. Fred J. Walls, International Nickel Co. Inc., Detroit, and Garnett P. Phillips, International Harvester Co., Chicago, presided as chairman and vice chairman, respectively.

Because it has long been recognized that physical properties of cast iron are so related to size of the section in which the iron is cast that one should not discuss properties without explicit knowledge of the section under consideration, E. R. Young, V. A. Crosby and A. J. Herzig, Climax Molybdenum Co., Detroit, presented a paper intended to throw further light on this subject. The authors had gathered data on 68 different plain and alloyed irons from companies in various parts of the United States to study physical properties in 2-inch sections. Results were obtained from data on A. S. T. M. type *C* bars, 27 inches long, broken on 24-inch centers to provide transverse test data.

Tensile tests were made on bars machined from the broken sections of the transverse bars. Brinell tests also were made. From these data, modulus of resilience and modulus of rupture were calculated. Impact tests on 1.125-inch diameter round, ground bars machined from the broken half of the 2-inch diameter arbitration test bars also were made.

On the basis of their investigation, the authors concluded that 70,000 pounds per square inch tensile strength cast iron unheat-treated in 2-inch section today is available commercially, and irons containing approximately 2.50 per cent carbon and 2.50 per cent silicon, when properly alloyed to obtain a balanced structure with approximately 300 brinell and processed for normal graphite, produce maximum physical properties in 2-inch section.

Paper Is Not Conclusive

In a written discussion, Ralph S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee, expressed doubt that it is advisable to establish specifications based on the information developed by this paper. He pointed out that only a limited number of samples fell within the 70,000-pound range.

Vice Chairman Phillips asked whether there is any treatment that can be given overheated iron to overcome the dendritic condition and poor physicals. Replying, Mr. Crosby asserted that addition of ferrosilicon not more than 2 minutes before pouring was effective in bringing the iron back. Another speaker stated his shop had experienced good success by adding silicon and graphite. Mr. Crosby defined superheat as any heat that prevents normal graphitic structure in the iron. Answering another question, Mr. Crosby said that providing composition is the same, type of melting furnace has no influence on producing the dendritic structure.

Reporting on an investigation of the effect of varying blast pressures on cupola melting and on properties of the resulting iron, J. T. MacKenzie and C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., concluded that their results indicate that blast pressure may be varied widely to change the melting rate, and that except for slight changes in analysis, the melted iron will show no undue variations from normal. Separate heats were made in a 21-inch test cupola using a wide range of blast pressures and two different kinds of metal charges.

This paper raised the old question of what is normal blast pressure and whether it relates chiefly to variation in cupola diameter and design. Mr. MacKenzie stated that type of coke influences blast pressure—higher pressures can be used with by-product coke than beehive. Mr. Phillips suggested that pressures would vary with charges. Mr. Donoho mentioned that beyond certain pressures, lining attack will be accentuated, thus this factor asserts an influence.

J. A. Bowers, American Cast Iron Pipe Co., summarized a paper on foundry and laboratory characteristics of cupola coke, prepared by Hugh O'Neill, L. M. S. Railway, Darby, England, and J. G. Pearce, director, British Cast Iron Research association, Birmingham, England, and originally presented before the Institute of British Foundrymen in June, 1937. Although the authors pointed out that the correlation between cupola and laboratory tests had proved rather unsatisfactory, the paper constituted an important step in throwing light on an important subject.

A detailed discussion of cupola operation constituted the official exchange paper of the Association Technique de Fonderie de France, prepared by Marcel Dudouet, professor, Ecole Superieure de Fonderie, Calvados, France. The paper was translated and abstracted by W. H. Spencer, metallurgist, Sealed Power Corp., Muskegon, Mich.

Deoxidation Affects Graphitization

Problems related to metallurgical control of cast iron occupied the time of the third and concluding technical session on gray iron on Tuesday morning. John W. Bolton, Lunkenheimer Co., Cincinnati, served as chairman, and Hyman Bornstein, Deere & Co., Moline, Ill., as vice chairman.

Presenting a paper on "Deoxidation and Graphitization," R. G. McElwee, Vanadium Corp. of America, Detroit, reported on an investigation made to effect better control of physical properties of iron in castings requiring abrupt changes in section. What is sought is close control of hardness of light sections without at the same time experiencing graphitization of heavy sections.

Experiments were made with cast wedges about 12 inches long with the large end having a section about 2 x 2 inches. These were cast in such a manner as to permit control of the chill in the thin section and graphitization in the heavy section. The author discussed the effects which deoxidation exerted upon graphitization.

Discussing the paper, G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., asked if aluminum displayed any distinctive effect in deoxidation, as compared

with titanium. Replying, Mr. McElwee said that titanium appears to be a little more sensitive and its effect does not last quite as long as aluminum.

Comparative effects of late additions of titanium and silicon to gray cast iron were considered in a paper prepared jointly by Mr. Comstock and E. R. Starkweather, Titanium Alloy Mfg. Co., Niagara Falls, N. Y. The paper gave results of tests on three grades of iron, each containing various amounts of chromium, and treated shortly before pouring with either foundry ferro-titanium or ferrosilicon. A comparison of effects of these late additions showed that with few exceptions increasing ferrotitanium additions gave increased strength and hardness, while increasing ferrosilicon additions gave either a smaller increase in those properties or a decrease.

Improvement Due to Graphite

According to Mr. Starkweather, the difference in effects of these two alloy additions was more marked as amount of the additions increased. The improvement resulting from the titanium additions was due largely to finer graphite and was more definite in higher-carbon or higher-sulphur irons. Sulphur was found to be effective in suppressing dendritic microstructure in the low-carbon chrome-titanium irons. The irons treated with titanium showed fewer flaws in the fractures of the test bars than either the untreated irons or those treated with ferro-silicon.

Castings usually go into service with the structure which originated during solidification and a knowledge of the mechanism of freezing therefore is useful to those attempting to control physical properties. Foundrymen, therefore, are interested in the size and distribution of graphite flakes. Recently Alfred Boyles, Battelle Memorial institute, Columbus, O., prepared a paper describing some experiments on this subject. In an attempt to formulate a theory on the basis of that work, Mr. Boyles prepared a second paper explaining the variation in size of graphite flakes in terms of composition gradients set up during the freezing process, and relating such gradients to variations in sulphur and manganese together with the conditions under which the iron is melted.

Conclusions which Mr. Boyles reached were: In hypoeutectic gray iron, graphite flakes form during freezing of the eutectic and grow radially from the crystallization centers of the eutectic liquid. With a given rate of cooling, size of flakes is determined by the rate of graphitization along the solid-liquid interface. Sulphur and hydrogen in solution in the eutectic liquid decrease the rate of graphitization, and the segregation of these elements produces composition gradients around each crystallization center.

The amount of sulphide remaining in solution in the eutectic liquid is determined by the extent to which sulphide inclusions have been precipitated in the melt above the eutectic temperature.

Manganese, by changing the solubility of the sulphide, limits the amount remaining in solution along the solid-liquid interface during the growth of the graphite flakes. An alloy of constant silicon and carbon content can be made to assume a great variety of structures by varying the manganese and sulphur contents and melting under circumstances conducive to a change in the amount of hydrogen in solution in the molten metal.

In discussion, Frank J. Dost, Sterling Foundry Co., Wellington, O., asked what type of structure is best for wear in machine tool castings. He stated his plant had been striving for a pearlitic structure. Mr. Bornstein said this could be answered only by experience. In automotive cylinders, for example, pearlitic structure is best, but this might not be suitable for some other service. Frederick G. Sefing, International Nickel Co. Inc., Bayonne, N. J., stated that in his experience irons with a dendritic structure had been associated with bad service.

Graphitization and inclusions in cast iron provided an interesting subject for discussion at a round table luncheon meeting presided over by H. Kenneth Briggs, Western Foundry Co., Chicago, with S. C. Massari, Association of Chilled Car Wheel Manufacturers, Chicago as vice chairman. Opening the discussion one speaker directed attention to the fact that 15 or 20 years ago probably only a corporal's guard would have turned up at a meeting called for the purpose of discussing graphitization in its many ramifications. The number of men present at this meeting indicated that the subject is a live one and engages the attention of a comparatively large number of gray iron foundrymen. Commencing with the molten iron where presumably all the carbon is in the combined form, he stated that many factors affect the final condition and distribution of the carbon in the metal as it cools to room temperature. He referred to the time factor and its many allied features as probably the most important.

Referring to certain views on the nuclei theory another speaker mentioned a peculiar phenomenon observed in a European foundry engaged in the production of centrifugally cast pipe. Direct metal from the blast furnace is poured into a mixer and raised to a temperature of 1500 degrees Cent. (2732 Fahr.). Test bars taken from the first metal in the mixer show a chill of 6 to 8 millimeters, while metal taken later showed a chill depth on the test bar of 25 millimeters. Despite these apparent wide variations in the chilling properties the pipes cast at any period showed the same physical properties.

A member detailed the results of a series of tests on small pigs, large pigs and flat cakes poured from the same ladle of iron. Melted in the cupola at ordinary temperatures the resulting iron showed considerable variation. Superheated in the electric furnace all the irons showed the same characteristics.

Malleable Annealing Has Made Progress

GENERAL conclusions drawn by Duncan P. Forbes, Gunite Foundries Corp., Rockford, Ill. from a paper describing spheroidized pearlitic malleable iron at a session presided over by Dr. H. A. Schwartz, National Malleable and Steel Casting Co., Cleveland, with Homer Wright, Michigan Malleable Iron Co., Detroit as vice chairman, indicate that after the massive cementite has been completely decomposed by prior heat treatment, the limit of solubility of combined carbon in austenite in the presence of temper carbon is increased with higher temperatures. A variation in the manganese content of the material has little if any effect on the limit of solubility of combined carbon in austenite in the presence of temper carbon. The combined carbon percentage remaining in the material after the spheroidizing operation is increased with higher percentages of manganese. Combined carbon percentage remaining in the material after the spheroidizing treatment is not affected greatly by the temperature in the ausenitic range from which the material was air cooled. With increased combined carbon content, or with increase in

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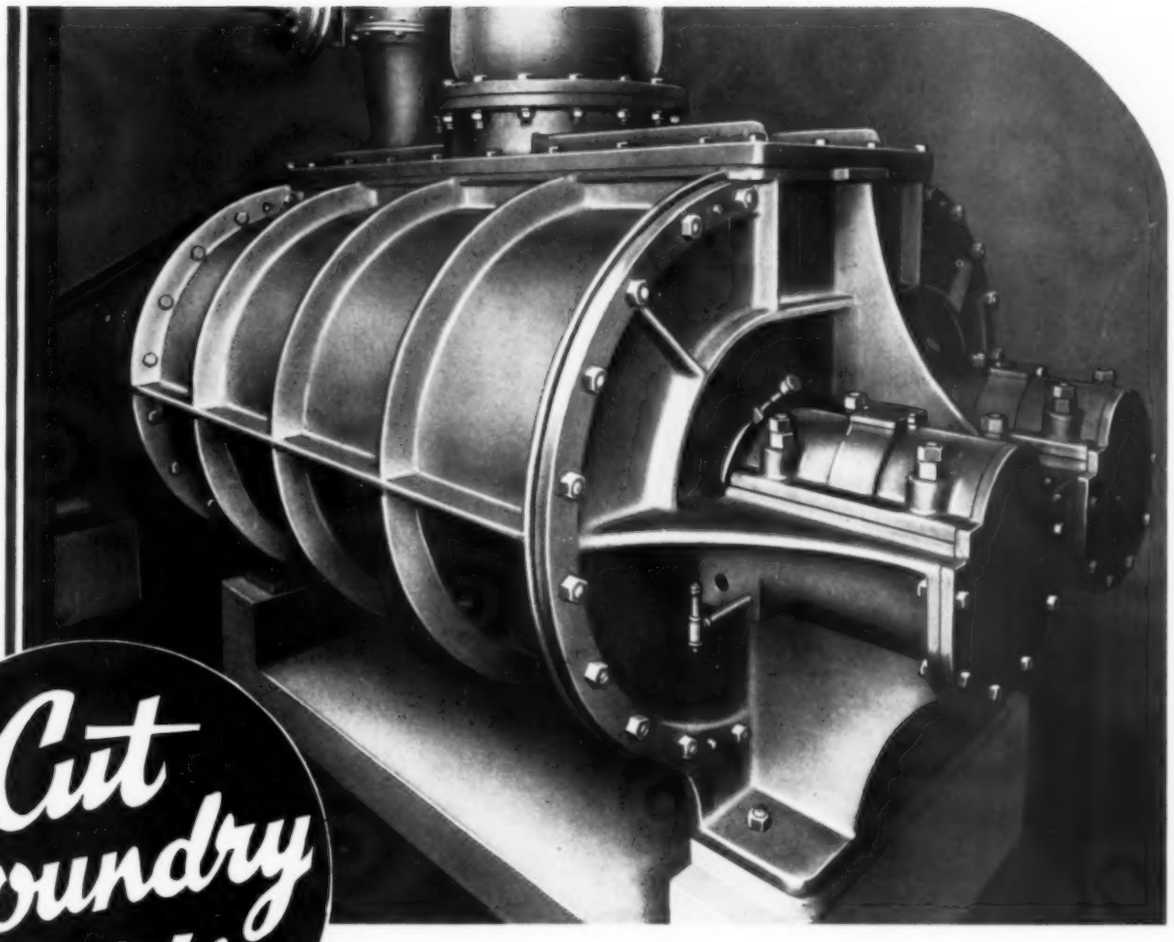

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Manually or automatically controlled to give constant weight of air, Roots-Connersville Positive Displacement Blowers are the modern foundry blower equipment. They are helping many foundries step up both quality and quantity of output while reducing costs.

The Roots-Connersville Positive Displacement Blower shown above was recently installed in the plant of a large Illinois manufacturer of hardware specialties. Operating with constant air weight control, this blower helps that modern plant keep foundry costs down.

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(*Continued from page* 80)

manganese—the cause of increased combined carbon content—the ultimate tensile strength and the yield strength are increased while the percentage of elongation is decreased.

A paper presented by W. D. McMillan, metallurgist, McCormick works, International Harvester Co., Chicago, covered the production of fully annealed malleable iron in a cycle of approximately 14 hours. The author discussed charging and molding practice, composition of the metal, annealing procedure and mechanical properties of the metal from a practical viewpoint. Silicon is higher than in the usual type malleable iron, in this instance about 1.73 per cent with carbon 2.20 per cent. Two factors operate to shorten the annealing time, the higher silicon content which promotes graphitization and the high percentage of net metal in the annealing furnaces made possible by elimination of heavy annealing pots. The short cycle malleable iron shows a tensile strength of 55,000 to 60,000 pounds per square inch with an elongation of 15 to 20 per cent. Yield point is approximately 44,000 pounds per square inch. He claimed that this type of metal should prove of general interest because of the lower annealing cost and the high tensile properties. He also discussed the possible suitability of this type of iron for the range of castings usually produced in malleable iron.

Hardens the Surface

In a paper entitled "Pearlitic Malleable-Tocco Hardened," W. E. Benninghoff, Ohio Crankshaft Co., Cleveland, described the equipment and process for hardening the surface of pearlitic malleable iron camshafts. Surfaces to be treated are heated electrically and then quenched with a water spray. On account of the rapidity of the process the heating does not affect grain growth. With proper equipment it is claimed a workman can treat 60 camshafts per hour.

More than 150 attended the malleable cast iron session held Thursday morning. Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham, Ala., presided as chairman with Fred L. Wolf, Ohio Brass Co., Mansfield, O., as vice chairman. The first paper by A. L. Boegehold, General Motors Research Laboratory, Detroit, described experimental work in determining the shortest practical annealing cycle for two production castings, a small one and a large one. Harry A. Schwartz, National Malleable & Steel Casting Co., Cleveland, in discussing the paper pointed out that primary graphitization ratio remains about the same even though heating rates change. That is indicated by completion in 1 hour for light sections and 5 hours for heavy sections at 1700 degrees Fahr. after slow heating. With rapid heating the times are 4 hours and 25 hours respectively, or about 4 and 5 to 1.

H. Bornstein, Deere & Co., Moline, Ill., said that he found that best results for short cycle annealing were obtained by placing in a cold furnace, and raising to 1350 degrees, holding for a short time, and then running the temperature up to around 1700 degrees. R. J. Cowan, Surface Combustion Co., Toledo, O., stated that some experimental work indicated that grain size might have considerable to do with annealing of malleable iron. Test sprues poured at different periods of melting when annealed together showed different structures. Also when specimens were held for 20 hours at 1000 degrees, first stage graphitization was complete in 2 hours as compared to 15 hours in samples which did not receive a holding treatment.

The second paper by E. G. de Coriolis and R. J. Cowan, Surface Combustion Corp., Toledo, O., and presented by Mr. de Coriolis, discussed atmosphere control in annealing malleable iron. According to authors a wide range of gas compositions is available to prevent or retard decarburization, and to reduce the time of annealing. In addition a theoretical curve representing the demarcation between carburizing, decarburizing, and decarburizing and surface oxidation zones was presented with curves from furnaces operating with controlled atmospheres to show the close similarity.

H. Bornstein in the discussion presented some curves which agreed with those of the authors. He pointed out little difference is obtained with atmospheres containing a ratio of 3 parts of CO to 1 part of CO_2 and those containing 2 parts CO and 1 part CO_2. Consequently, in his furnace the atmosphere is maintained at the 2 to 1 ratio throughout. He also pointed out that in his opinion a change of silicon content has a more important effect than the change in atmosphere. Mr. de Coriolis replied that the latter was true, but in the paper the idea was to consider effect of annealing on surface conditions of the castings. A question was asked on the effect of employing a carburizing atmosphere, and it was stated that with the comparatively high carbon content of malleable, it would be difficult to obtain such an atmosphere. Also there was the possibility that graphitization might not proceed as desired.

Discuss Malleable Iron

Final paper of the session was presented by H. H. Harris, General Alloys Co., Boston, on the role of heat resisting alloys in short cycle malleablizing furnaces, and described some of the problems encountered, and the newer types or designs of castings available for such applications.

Discussion at the malleable iron round table luncheon on Thursday under the chairmanship of James H. Lansing, Malleable Iron Founders association, Cleveland and Fred L. Wolf, Ohio Brass Co., Mansfield, O., was confined to further consideration of certain points raised in a paper presented at an earlier session "Factors Influencing Annealing Malleable Iron" by A. L. Boegehold. In this paper it was stated that an investigation conducted by the author a number of years ago to determine the shortest time cycle for annealing iron disclosed among other things that the teaching of literature in some respects did not apply. Discrepancies to some extent may be due to the fact that the iron under investigation is melted in a cupola and then transferred to a direct arc electric furnace and heated to casting temperature. Average analysis is: Silicon 1.15 to 1.20 per cent, carbon 2.70 to 2.75 per cent, manganese

(*Continued on page* 85)

Contest Winners

PATTERNMAKING

1—John Bloomquist
John Deere Harvester Works, East Moline, Ill.
2—Edward A. Menzel
Brown & Sharpe Mfg. Co., Providence, R. I.
3—William Thorpe
Caterpillar Tractor Co., Peoria, Ill.

NONFERROUS MOLDING

1—Joseph Wyban
Art in Bronze Foundry, Cleveland
2—Harry Smith
Mississippi Foundry Corp., Rock Island, Ill.
3—Casimir Kotowicz
Ampco Metal Corp., Milwaukee

STEEL MOLDING

1—Richard Reynolds
West Steel Castings Co., Cleveland
2—John Paliwoda
West Steel Castings Co., Cleveland
3—Jalmer Nelson
American Steel Foundries, East Chicago, Ind.

GRAY IRON MOLDING

1—Chester Marzec
Cleveland Trade School, Cleveland
2—Robert Pohlman
St. Louis
3—Jerry Halek
Johnston & Jennings Co., Cleveland

(*Continued from page 82*)

0.38 to 0.42 per cent, phosphorus about 0.05 per cent, and sulphur 0.09 to 0.11 per cent. Experiments were conducted to determine the shortest practical annealing time for two production castings representing the largest and smallest casting in current production.

Results showed that the usually accepted idea that large temper carbon spots always are associated with heavy sections is not always correct. By heating to the primary graphitization temperature at a slow enough rate, the temper carbon spots in a heavy section may be as small and numerous as those in a light section, thus removing any relationship between as-cast structure and temper carbon distribution. Fast heating to the temperature for the first stage graphitization causes larger and fewer temper carbon spots than when heating is slow. The difference in size of temper carbon spots as a result of fast and slow heating is much more pronounced in heavy sections. The temperature range in which gamma iron, alpha iron and cementite exist simultaneously when heating at 100 degrees per hour is from about 1425 to about 1525 Fahr. compared to the published equilibrium diagram of 1380 to 1410 degrees Fahr. for this range. Complete elimination of pearlite in the second stage annealing may be accomplished at 1360 degrees Fahr.

Practice Problems Mark Nonferrous Papers

THREE interesting meetings on nonferrous problems featured the program. About 150 were present at the first session on nonferrous foundry practice. Harold J. Roast, Canadian Bronze Co., Montreal, Canada, presided as chairman with H. M. St. John, Detroit Lubricator Co., Detroit, as vice chairman. The first paper prepared by H. Fleck and T. C. Bunch, Pearl Harbor Navy yard, Honolulu, T. H., was presented by T. C. Watts, Falcon Bronze Co., Youngstown, O. It dealt with heat treatment of zinc bronzes to eliminate leakage under pressure. One alloy contained approximately 90 per cent copper, 5.1 per cent tin, and 3.3 per cent zinc while the other contained 87.5 per cent copper, 8.3 per cent tin, and 4.2 per cent zinc.

According to the authors heat treatment between 1300 and 1400 degrees Fahr. improved physical properties in most cases, and eliminated leakage. In the discussion Mr. Watts pointed out that while the procedure mentioned was suitable for production shops, it was necessary in jobbing shops to make sound castings in the first place through careful study of the pattern, gating methods, etc. J. J. Curran, Walworth Co., Greensburg, Pa., said the addition of slightly more lead than that called for in the specifications would reduce trouble from porosity, and that good melting practice would eliminate gas absorption which caused porosity.

John W. Bolton, Lunkenheimer Co., Cincinnati, O., pointed out the authors of the paper indicated that the heat treatment caused diffusion over the voids, which was contrary to actual facts since sections must be adjacent. He also does not believe the practice of heat treatment would be satisfactory for castings to withstand severe engineering service. Mr. Bolton mentioned that if it could be proved that some welding action occurred within the structure, it would be of considerable value to the industry.

Pour Through the Riser

A. E. Cartwright, Robert Mitchell Co. Ltd., Montreal, presented a paper prepared in collaboration with C. Brisbois of the same firm, on pouring nonferrous and ferrous alloys directly through the risers. A. J. Cassista, in a written discussion, stated that a similar method operated successfully for producing a sound casting of a combination drive wheel, flywheel, and fan for a compressor. T. J. Wood, Robins Conveying Belt Co., Passaic, N. J., mentioned that direct pouring as it is termed gave good results on a 14 per cent nickel, 7 per cent copper, 1 per cent chromium alloy iron employed for brackets. W. M. Ball, Edna Brass Co., Cincinnati, said that some alloys could not be poured successfully by the direct method due to the tendency to froth or foam, and cause defects. C. G. Wickham, Pennsylvania railroad, said he believed that the 80-10-10 alloy could be poured more cheaply by bottom gating, and the author stated that the only reason it was used in the particular case was because of certain difficulties encountered. Harold J. Roast, pointed out that in many cases direct pouring was the only way in which sound castings could be secured.

The final paper on the program was by George P. Halliwell, H. Kramer & Co., Chicago, in which he described a modification of the fluidity, spiral test. The method employs a special heated pouring cup and stopper and the test gave excellent concordant results. In the discussion O. E. Ellis, Toronto foundation, Toronto, Ont., stated the method is of value since it controls another variable. G. M. Thrasher, asked about use of a cold cup, and was informed that the stopper tended to stick and cause trouble. Kent R. Van Horn, Aluminum Co. of America, Cleveland, said he thought the foundryman would be more interested in what happened in a casting rather than in a test bar, and that he believed the test bar would not always give the same result as might obtain in a casting.

At the close of the meeting, a business session was held in which H. J. Roast was elected chairman for the ensuing 2 year term, and W. J. Laird, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was elected vice chairman. T. C. Watts, R. W. Parsons, and C. V. Nass, were elected on the advisory committee. Harry M. St. John, presented a report of the committee on the analysis foundry defects, and H. J. Rowe, Aluminum Co. of America, Cleveland, reported that the committee on recommended practice has finished recently two reports on recommended practices for high lead bronze, and manganese bronze.

An excellent attendance featured the second nonferrous session held on Tuesday morning under the direction of Harry M. St. John, chairman, and R. W. Dayton, Battelle Memorial institute, Columbus, O., vice chairman. The first paper prepared by H. W. Gillett, of Battelle was presented in his absence by one of his associates, Dr. C. H. Lorig. It was pointed out in the paper that much of the mystery surrounding effects of silicon in nonferrous alloys has been dispelled by research, and that at present it is used extensively in many alloys.

Production Is Difficult

Silicon is used in magnesium-base, aluminum-base, copper-base and nickel-base alloys, and in the paper the action of silicon in those alloys is described. In addition much information on physical and mechanical properties of the various alloys is given. In the discussion L. W. Kempf, Aluminum Co. of America, Cleveland, mentioned that commercial production of 14 per cent, modified type, silicon-aluminum alloys is rather difficult. If the sodium is not added properly, and the alloy not poured within a reasonable time after the reaction between sodium

and metal occurs, the desired physical properties will not be obtained.

George P. Halliwell said that small additions of silicon to manganese bronze affected that structure appreciably. He mentioned that the addition of 1½ per cent silicon had the same effect on the alpha-beta to beta structure of a 42 per cent zinc alloy as with changing the zinc content to 59 per cent. Silicon addition also decreased the ductility of the alloy. Harold J. Roast mentioned that in some cases a small quantity of silicon is added to leaded bronze to obtain a harder surface, but then only in such cases where the ill effects of the combined presence of lead and silicon, was of no importance.

Harden Nonferrous Castings

The second paper presented at the session was by W. L. Kempf and consisted of a very interesting exposition of the age hardening process as applied to castings. He said that with the growing knowledge on the subject, he believed that there would be greater application of various hardening treatments applied to nonferrous alloys. C. B. Sawyer, Beryllium Corp., in discussing the paper mentioned the application of beryllium in age hardenable alloys to obtain high strength, fatigue resisting materials. Dr. C. H. Lorig inquired whether changes in structure as revealed by the microscope might be used to indicate precipitation hardening, and it was stated that the actual change was so small in most cases that there would be no noticeable difference, unless the investigator was experienced with the particular alloy being examined.

Final paper of the program was presented by T. E. Kihlgren, International Nickel Co., Bayonne, N. J., and described the production of castings in age hardening, nickel-tin alloys. One of the alloys contained 88 per cent copper, 5 per cent tin, 5 per cent nickel, and 2 per cent zinc. As cast it has a tensile strength of about 48,000 pounds per square inch, but with a 2 to 5 heat treatment at 1400 degrees Fahr., cooling in air or by quenching and drawing at 550 to 600 degrees Fahr., the strength ranged from 70,000 to 90,000 pounds per square inch.

In discussing the paper W. M. Ball, asked about the operating temperature range for a heat treated alloy, and the reply was that it would have to be not less than 100 degrees under the drawing temperature or say 400 to 450 degrees Fahr. Others participating in the discussion included G. P. Halliwell, R. B. Parsons, Ohio Brass Co., Mansfield, O., and J. J. Kanter, Crane Co., Chicago.

More than 100 attended the round-table nonferrous conference luncheon held Tuesday noon. H. J. Rowe, Aluminum Co. of America, Cleveland, presided, and following the luncheon a spirited discussion covering many phases of nonferrous melting and molding practice took place. The meeting opened with the presentation of a paper on crucible melting furnace developments which was prepared by R. H. Stone, Vesuvius Crucible Co., Swissvale, Pa. In the discussion following the paper it was brought out that approximate fuel costs in crucible furnaces ran $1.50 for oil, $2.03 for coke, $2.40 for artificial gas and $3.20 for natural gas. Those figures were for a ton of metal.

In nonferrous problems discussed, it was pointed out that the brownish discoloration which appears at times near the gates of aluminum alloy castings may be due to a variety of causes such as high pouring temperature, presence of manganese, off-grade ingot metal, etc. The discoloration essentially is an oxide which only affects the surface, and none of the physical or mechanical properties. Objection to it is only on the appearance basis. Another problem discussed was the presence of zinc worms on the hexes of globe valves. Remedies suggested were improvement of molding sand, particularly with regard to moisture content; using as dry a sand as possible; keep a cover on the metal during melting and pouring; employ a skim core in the sprue, and use a sprue which is not too large so that it can be filled rapidly, and maintained in that condition until the mold cavities are filled.

A third problem which engaged attention was the appearance of a small hole in the cope side of globe valve castings. Since a specimen was not available for inspection, suggestions as to the cause had a wide range and included improperly baked core, sand of low permeability, hard ramming on cope side, lack of vent from core to outside of the mold, and possibility of a sag in the cope mold so that it tended to touch the core.

Steel Session Reports on Radiography Survey

USE of radiography for exploration of defects in steel castings is looked upon with favor by some manufacturers, according to results of a questionnaire presented at the first session on steel castings under the chairmanship of John Howe Hall, Philadelphia.

In presenting the "Report of Committee on Radiography" C. W. Briggs, Naval Research laboratory, Washington, and chairman of the committee, explained that a questionnaire had been sent to 251 organized steel foundries in this country and that 49 replies had been received. Nineteen of the companies replying use radiography and the returns indicated that 39 per cent had made some study of the subject. Approximately two-thirds of those replying to the questionnaire stated that they hesitated to use radiography because of cost. Others pointed out that incorrect interpretation of results had curtailed the installation of that equipmen. Fourteen companies stated they would take orders for castings subject to radiographic examination; two stated they would not.

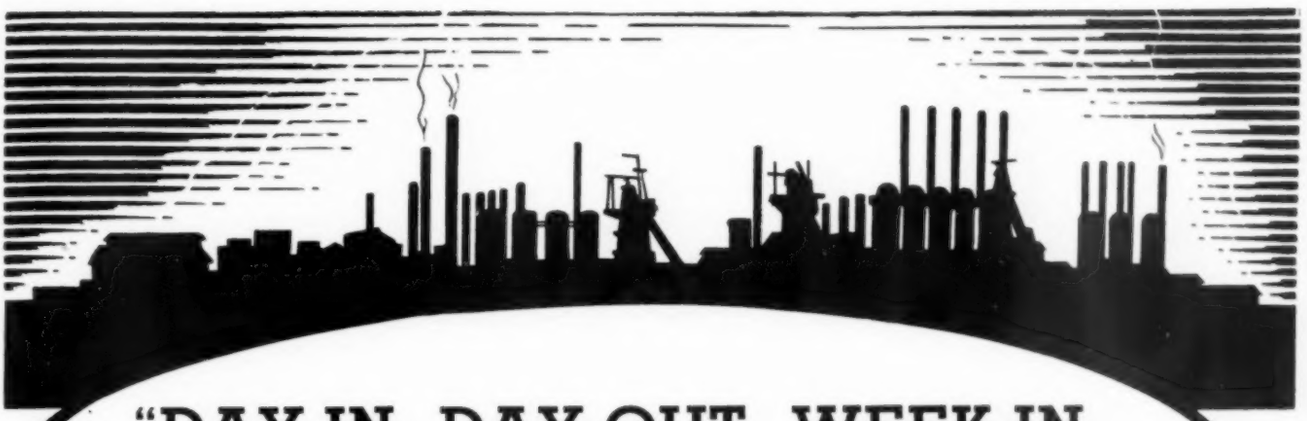
The speaker was of the opinion that certain specifications should be used in connection with the radiography but he cautioned that more study is necessary. He suggested that another questionnaire be sent out among the industry in 5 years, but later discussion from the floor was that on account of progress in this direction another questionnaire should be circulated not later than 1 or 2 years hence. In conclusion the speaker stressed the importance of the D-7 Committee of the A. S. T. M.

X-ray Equipment Pays

J. R. Hewitt Jr., American Manganese Steel Co., Chicago Heights, Ill., in discussing this report pointed out that while X-ray equipment is expensive yet it soon pays for itself. He mentioned that equipment installed at his plant cost $30,000 and involved a yearly operating cost of $2500. The equipment has been operated for a little over 3½ years. Before the equipment was installed at the plant about $50,000 annually was refunded to customers absorbing heat resisting alloy castings. Last year, the speaker pointed out, the refund was less than $15,000. The speaker expressed the opinion that radiography was directly responsible for a reduction in the amount of adjustments.

Ductility and impact values of steels vary inversely with the sulphur content, even with no alumi-

(*Continued on page* 88)



"DAY-IN, DAY-OUT, WEEK-IN, WEEK-OUT, YEAR-IN, YEAR-OUT *You've Laid It On the Line"*

SPEAKING recently to one of our representatives, the executive of one of the largest foundries in America, which makes a complete chemical analysis of every carload of pig iron before it is unloaded, had this to say of Woodward Iron:

> *"Your ability to lay it on the line has been a revelation to us. Day-in, day-out; week-in, week-out; year-in, year-out over a period of three years, every shipment we have received from you has been practically identical. Never before in our many years in the foundry business, have we purchased pig iron of such uniform character."*

Woodward's ability to deliver iron of uniform consistency is due in large part to the fact that *Woodward's base ore burden is always from the same ore body*—its own mines in the company's vast ore holdings in the Red Mountain range, combined with uniform furnace control through every phase of production.

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We invite you to give Woodward Iron a trial, test it by the most rigid standards and establish to your own satisfaction its outstanding uniformity and quality.

WOODWARD IRON COMPANY
WOODWARD, ALABAMA

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

(*Continued from page 86*)

num addition. Furthermore, for any given aluminum addition, the ductility is lower the higher the sulphur content. These facts were related by C. E. Sims, Battelle Memorial institute, Columbus, O., in speaking on "Effect of Aluminum on the Properties of Medium Carbon Cast Steel." F. B. Dahle, Battelle Memorial institute, was co-author of the paper.

Effect of increasing sulphur, the speaker stated, is greatest when the aluminum content is that which gives the lowest ductility. After recovery of ductility, the effect of quantity of sulphur is practically the same as when no aluminum is used.

Note Effect of Aluminum

The essence of the paper was the number of results carried on as a series, each correlated with one another so as to obtain a complete series for comparison. Widespread discussion followed the presentation of this paper, both written and from the floor.

Fred Grotts, Lebanon Steel Foundry Co., Lebanon, Pa., citing tests conducted by a group of founders in the East, mentioned that physical properties of castings showed practically no variation whether 4 pounds of aluminum per ton was added or 4 to 6 ounces or none at all. He emphasized that with high aluminum additions there is an absence of woody structures. H. H. Blosje, Minneapolis Electric Steel Castings Co., Minneapolis, Minn., mentioned an aluminum addition of 2 pounds per ton of metal as giving good results.

Refractoriness of sand is measured by the sintering temperature. This was emphasized by H. W. Dietert, Harry W. Dietert Co., Detroit, in speaking on "A Study of Steel Molding Sands" at the Tuesday afternoon session on steel castings. Co-authors of the paper, in addition to Mr. Dietert, were E. E. Woodliff and J. A. Schuch of the Dietert company.

Sintering temperatures cited by the speaker for steel sands range from 2450 to 2750 degrees Fahr. Sand possessing the higher sintering temperature, he stated, consisted of crude silica or washed silica. The sintering temperature of the sand decreases rapidly as reclaimed sand is added to the facing, he warned. The maximum sintering temperature of any sand is obtained with a minimum clay content.

Grain distribution in the 33 samples tested was found to be narrow for the most part. A molding sand may be classed as having excellent grain distribution when three adjacent sieves of 40, 50 and 70 mesh retain 75 per cent of the sand grains, in the opinion of the speaker.

Moisture contents in steel sands necessarily are kept low, Mr. Dietert observed. The average for green sands he reported as 3 per cent while the dry sands averaged 1.5 per cent higher or 4.5 per cent moisture.

Tests disclosed that the average green compression strength of green sand was 6.3 pounds and 6.2 pounds for dry sand. The higher the green strength, the lower the sintering temperature, the speaker contended, in that the clay bond may be considered as a fluxing element with silica.

In presenting a report of committee for 1937 on "Methods for Producing Steel for Castings," H. Phillips, Dodge Steel Co., Philadelphia, cited the most striking development in the electric arc furnace as the rotating hollow graphite electrodes as used by the Ludlum Steel Co., Watervliet, N. Y. He mentioned that cupola hot metal duplexing for electric steel foundries had been carried further and that there was a revival of interest in the converter process.

Heat Treat Continuously

The speaker drew attention to the use of titanium to control the grain growth of medium manganese steels with the result that the yield strength and impact resistance are markedly increased with no loss in ductility. The report submitted by Mr. Phillips was approved by members of the steel foundry division of the association.

A 5-zone continuous heat treating furnace for the heat treating of manganese steel castings was stressed as the most important development during 1937 by David C. Zuege, Sivyer Steel Casting Co., Milwaukee, and chairman of the A.F.A. committee on heat treating. He pointed out that this furnace has effected a fuel saving of 35 per cent.

The speaker drew attention to the fact that in those foundries producing medium and small steel castings there has been a trend toward the greater use of double or triple heat treatments. Furthermore, in some instances, he stated, liquid quenched and drawn carbon steel castings have replaced normalized and drawn low alloy castings with equally good results and lower cost.

Flame hardening was mentioned as having made significant advances in 1937. In conclusion the speaker announced that his committee proposes to make a survey this year of the types of heat treatment being used in the steel foundry, the degree employed and the results being secured. This report also was accepted by members of the steel division.

Advantages of calcium as a deoxidizer was recommended by A. P. Gagnebin, International Nickel Co., Bayonne, N. J., at the Thursday morning meeting of the steel testing division. Mr. Gagnebin, in speaking on "Effect of Deoxidation Treatments on the Ductility of Cast Steel," pointed out that calcium is able to maintain sulphide dispersion in the presence of aluminum. A chart which accompanied the author's paper, showed a drastic increase in the impact value by the use of calcium. Addition of this element, however, had no effect on the ductility. The speaker drew attention to the fact that calcium must be added to the melt under a slightly oxidized condition, the most efficient practice being to force this deoxidizer into the melt. The addition of aluminum and calcium in combination produces a higher yield point than when aluminum is used by itself as a deoxidizer.

Under certain conditions it is impossible to design a casting so that prominent hot spots are eliminated, and, since excessive temperature gradients will be present, it becomes necessary to relieve major stresses resulting therefrom by some other means. That the foundryman has at his command a method to reduce these stresses by employing mold relieving principles was brought out by C. W. Briggs, Naval Research laboratory, Washington. Mr. Briggs spoke on "Steel Casting Design for the Engineer and Foundryman," which was prepared by himself, R. A. Gazelius, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and A. R. Donaldson, Naval Research laboratory, Washington.

Preventing Contraction

The designer also can aid toward producing a more stress-free situation by designing an intricate casting in two, three or more parts, and the speaker suggested that these finally could be assembled into one complete casting by joining the various cast parts by welding or bolting.

One of the most difficult features about designing to prevent contraction cavities, according to Mr. Briggs, is to know when and where feed heads are to be placed. Sections of the "L" type, in the opinion of the speaker, should have an inside radius ranging from ½ to 1 inch. Practice of designing the section at the junction slightly smaller than that of the arms appears to give the best results, he continued.

Mr. Briggs made it plain by slides that an "X"-section could not be designed that could be made free from a contraction cavity, if the section were fed only through the

(*Continued on page 91*)

(*Continued from page* 88)

arms. He explained, however, that the defect could be made small by designing the section with a cored hole.

Only when the temperature gradients within the metal and the molds are such that the feed heads are the last portion of the casting to solidify, and thus can furnish liquid metal to fill the voids formed during solidification, can a sound casting be produced.

In conclusion the speaker directed attention to the fact that models of the original design at a suitable scale are helpful to both the designer and foundrymen, inasmuch as the changes required can then be pointed out. After the foundryman has obtained a workable design, he can use the tools at his command, such as tapered sections, proper gating and heading, chills, relieving blocks, to preclude the possibility of shrinkage cavities and hot tears.

Discuss Internal Chills

Discussion at the steel division round table luncheon conference Wednesday centered around the design of steel castings, converter steel castings and the cement mold process of making molds for steel castings. The meeting was conducted by Ralph H. West, West Steel Casting Co., Cleveland, as chairman, and A. H. Jameson, Malleable Iron Fittings Co., Branford, Conn., as vice chairman. Opening the meeting, Mr. West suggested that before taking up the regular items on the agenda, half an hour might be devoted to further discussion of a paper prepared by C. W. Briggs and A. R. Donaldson, Naval Research laboratory, Anacostia, Washington, and R. A. Gezelius, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., on the subject of steel casting design for the engineer and foundryman and presented at the 10 a. m. session. F. A. Melmoth, Detroit Steel Casting Co., Detroit, chairman at the former meeting, presided during this preliminary discussion which centered around the use of internal chills. Several speakers deplored the necessity of using internal chills, but admitted that up to the present no other practical solution had been found for overcoming certain forms of defects. Attention was directed to the fact that proper care must be exercised in placing the chills and also in making sure that the chills are clean. Otherwise they may defeat the object for which they are intended and create blow holes in the casting. Referring to a point sometimes raised in comparison between European and American steel foundry practice a speaker claimed that during a European tour he had seen as many internal chills used in French and Belgian steel foundries as in the United States. The practice is universal.

On the subject of designing castings properly before they enter the foundry a member claimed that the foundryman is handicapped in any conference by two factors which predominate in the minds of the other conferees, quality and cost; not the ultimate cost which the foundryman clearly can envisage, but the immediate cost. For example on blank gears instances were cited where efficient risers would produce solid castings, but objections to their use was encountered on the ground of the excess metal and in some instances the excess machining required.

Discussing the decline of the converter as a steel making unit it was pointed out that conditions are different now to those which prevailed several years ago and that a distinct renaissance is noticeable in quickening interest in this type of steel making unit. Without exception several speakers declared that the converter is as competent as any other medium for producing high class steel. Interesting reminiscences were presented of early converter experiences in England, introduction of the side blow converter and conditions surrounding the development of manganese steel.

Apprenticeship Training Shows Progress

INDUSTRY seems to be keeping more apprentices at work in the present discouraging state of business than it did in 1929, said Dean C. J. Freund, University of Detroit, Detroit, in opening the session on apprentice training. Dean Freund introduced V. J. Hydar, Falk Corp., Milwaukee, and chairman of the A. F. A. committee on apprentice training, who gave a report of the committee's work for the past year.

Mr. Hydar announced the following winners in the national apprentice contests: *Gray iron molding*, Chester Marzec, Cleveland Trade school, Cleveland, first; Robert Pohlman, St. Louis, second; and Jerry Halek, Johnston & Jennings Co., Cleveland, third; *Nonferrous molding*, Joseph Wyban, Art-in-Bronze Foundry, Cleveland, first; Harry Smith, Mississippi Foundry Corp., Rock Island, Ill., second; and Casimir Kotowicz, Ampco Metal Corp., Milwaukee, third; *Pattern making*, John Bloomquist, John Deere Harvester Works, East Moline, Ill., first; Edward A. Menzel, Brown & Sharpe Mfg. Co., Providence, R. I., second; and William Thorp, Caterpillar Tractor Co., Peoria, Ill., third; *Steel molding*, Richard Reynolds, West Steel Casting Co., Cleveland, first; John Paliwoda, West Steel Casting Co., second; and Jalmer Nelson, American Steel Foundries, Chicago, third.

The question of giving apprentices membership in the A. F. A. was considered briefly and left for further study by the committee. Robert E. Kennedy, technical secretary of the A. F. A., told of plans either to photograph the winning patterns and molds or to ship the patterns and molds themselves from chapter to chapter so that practices apparently developed in different parts of the country might be studied.

J. E. Tepoorten, occupational extension service, Wisconsin Vocational schools, Madison, Wis., spoke on "The Wisconsin Training Plan." He said that due to the human element apprenticeship cannot be standardized and that the best place to learn any trade is on the job. Mr. Tepoorten described Wisconsin's circuit teacher system under which specially trained instructors travel regularly through the state, meeting not only with apprentices but also with vocational directors and academic teachers. He said that two trained foundry instructors are now working under the circuit system thus making possible an apprentice program for small foundry centers.

Compares Old and New

E. N. Brough, Fairbanks, Morse & Co., St. Johnsbury, Vt., presented a paper entitled "Foundry Apprenticeship in a Commercial Shop." He described the old method of training under which the boy came into the foundry as a helper for about six months, then became a helper paid by the molder with whom he worked and, finally when the boy could do a certain class of work, he was given a floor of his own and worked day work until piece work rate would yield him greater pay. This system made a specialist of the boy who was in a hurry to make money. Mr. Brough said the new system requires the boy to spend the first year in a vo-

cational training school which is separate from, but functions directly with the shop. The second, third, and fourth year students spend alternate weeks in the class room and the factory, with the school superintendent co-operating with the factory in training them.

A. W. McCallum, Anthes Foundry Ltd., Winnepeg, Man., Canada, gave a paper on "The Apprentice Training Situation in Western Canada." He said that patterns brought to him by boys from classes in high school were invariably impractical and that the amount of time at the disposal of both students and teachers is too little to make the vocational training a practical part in an academic curriculum. He maintained that not beautiful modeling, but the necessity for partings, working drafts, shrinkages of metals, molecular action of metals, gating, the use of risers, etc., should be taught prospective molders and pattern makers. Mr. McCallum gave his opinion that apprentices in the kindred trades of molding and pattern making should spend some time in each shop.

Advises Co-operative Work

Discussion after the papers by A. R. Luebke, Fairbanks, Morse & Co., Beloit, Wis., added information about apprentice training in Wisconsin. Wayne Stettbacher, Employers' association, Detroit, brought out the advisability of several shops co-operating to offer the apprentice a thorough, general training. Frank Cech, Cleveland Trade school, raised the question of the value of high school training to the apprentice and said that much of the best apprentice material enters trade school before completing high school.

Danger of nepotism within the plant where sons are trained and fostered by fathers was cited by A. L. Strang, American Steel & Wire Co., Cleveland. B. B. Wittfoht, Caterpillar Tractor Co., Peoria, Ill., said he believed in the system of testing boys by impartial examinations. J. G. Goldie, Cleveland Trade school, outlined a program which would make the apprentice less specialized and would require perhaps as much as five years of apprentice training. Prof. C. H. Casberg, University of Illinois, Urban, Ill., asked why the boy who learns more quickly should not be allowed to finish his apprenticeship in a shorter time. Examples of training for more or less specialized jobs were cited by Stanley M. Brah, International Correspondence schools, Chicago, in support of Professor Casberg's intimation. Others discussing the matter favored a uniform term of apprenticeship and so training the quicker boy to be a still better craftsman.

At a second session of apprentice training held at the Cleveland Trade school, Frank Cech described the organization and function of the school and told about the co-ordinating work of keeping track of the boys after they are placed in industry. Mr. Cech said management of local plants had been very co-operative. Dean C. J. Freund raised the question of transferring a boy from one section of the school to another, and Mr. Cech said this practice helped reduce the mortality rate and was a factor in the relationship between mortality rate and the quality of incoming material, which had been brought out by E. Armstrong, Inter-Allied Foundries, Buffalo. In regard to the success of apprenticeship training, John E. Kemp, Walworth Co., Kewanee, Ill., corroborated what Mr. Goldie said about the need for converting the foreman and the worker to the apprenticeship training idea.

A REPORT of the interesting sessions on sand research, refractories, material handling equipment, costs, cupola melting, molding and core sands, malleable cast iron furnace practice, and job evaluation held during the convention week in Cleveland will be presented in the July issue of THE FOUNDRY

Those attending this session saw apprenticeship training put to the crucial test. Mr. Goldie brought 18 boys into the classroom from the adjoining foundry and these boys were tested at random by the visitors with questions on foundry theory. Close relationship of theory and practice was evident as boy after boy successfully answered these questions, often obviously visualizing in his mind and with his hands the way he had met or worked with that problem in the school foundry. The boys in the foundry were working on music stand racks for the board of education and also machine part castings. In the pattern shop runner patterns and special patterns for gears, pulleys and propellers were being made.

A. C. Horrocks, educational director, National Association of Foremen, and Goodyear Tire & Rubber Co., Akron, O., spoke on management and foreman training at the Monday session over which A. D. Lynch, J. I. Case Co., Racine Wis., presided. Introducing the subject, Mr. Lynch said that in the last 5 years it has become more than ever necessary to have trained foremen and that, in order to take advantage of such progressive changes as may come about, foremen must know what to do and how to do it. Before introducing the speaker, Mr. Lynch mentioned the wide background of Mr. Horrocks in personnel and industrial education work.

The foreman's job is not alone that of getting out the work, according to Mr. Horrocks, but the foreman must be trained to do the valuable work of human engineering. Saying America is already through the first two phases of its development, financing and mass production, and now, 10 years before industry is ready, it is in the third phase which is that of industrial relationship, the speaker stressed the fact that the foreman must take new responsibilities as the middleman between management and the workers.

Give Counsel and Advice

Mr. Horrocks said that the older workers in industry must be used for counsel and advice and that city boys must be given training comparable to that of farm boys whereby the city boy may learn how to work and apply himself. He emphasized the value of applied psychology and said the new science of human relations must be based on common sense. Considerable discussion after the address turned upon this point when George J. Leroux, National Malleable & Steel Castings Co., Cleveland, asked whether the engineering schools were giving industry men who could be effective in human relations as well as in technical problems. Mr. Horrocks answered that a few of the more progressive schools had recognized the need of teaching applied psychology and public expression, but that much remained to be done. Mr. Leroux also brought out discussion, the consensus of which favored procuring a man for industrial relations from within the company instead of from outside.

George E. O'Brien, George E. O'Brien & Associates, Cleveland, asked what amount of information should be given to foremen, and the discussion bore out that many companies are giving more and more nearly complete information about financial and managerial matters to their foremen and workers. L. O. Taylor, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., contributed to the discussion covering time and frequency of foremen's meetings and education of foremen.

F.E.M.A. To Meet

The summer meeting of the Foundry Equipment Manufacturers association has been tentatively scheduled for Friday, June 24, according to Arthur J. Tuscany, secretary. The location of the meeting will be decided shortly.

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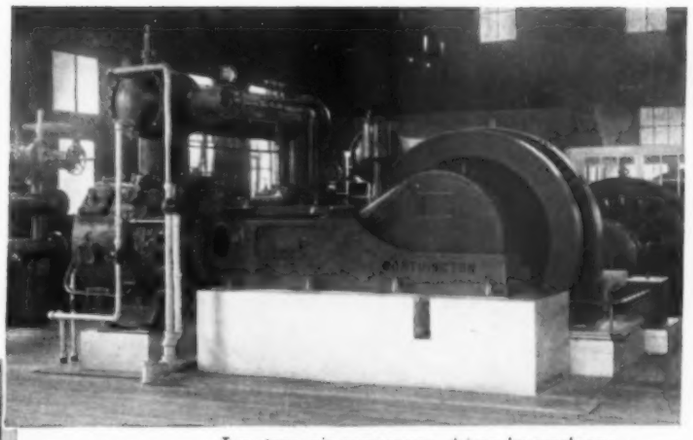
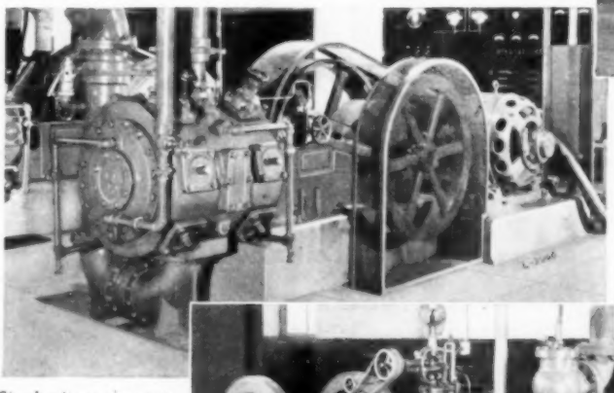
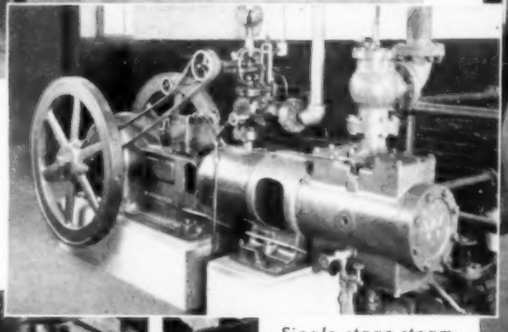


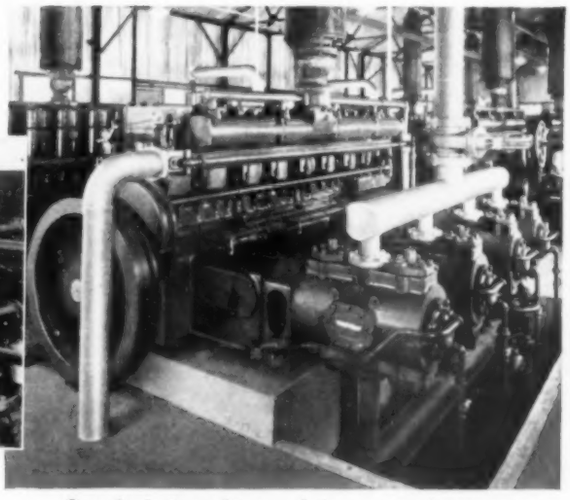
Two-stage air compressor, driven by synchronous motor, recently installed in a large steel foundry



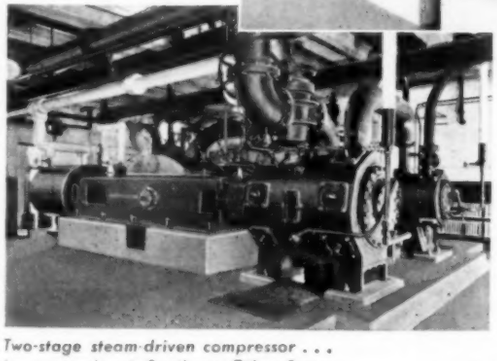
Single-stage air compressor, motor driven through Worthington Multi-V-Belt drive, supplying air to a pneumatic tube system



Single-stage steam-driven air compressor . . . in the service of a Western railroad



One of a battery of ten angle type gas engine compressors . . . in a large natural gasoline plant in the Midwest



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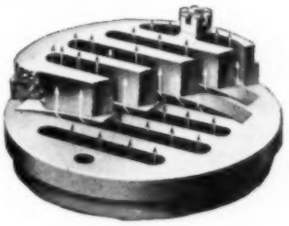

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Progress Is the Keynote of Splendid Exhibition

(*Continued from page* 33)

International Molding Machine Co., Chicago, had 21 different sizes and types of molding and core making machines on display. Six different sizes of core blowing machines were shown, the largest capable of handling cores up to 160 pounds. Molding machines shown at the booth of the Johnson & Jennings Co., Cleveland, included a portable jolt squeezer, a jolt stripper, stationary jolt squeeze, jolt squeeze pattern draw, jolt roll-over pattern draw. Several of these machines were equipped with special quick clamping devices and automatic leveling tables. Vibrators and miscellaneous equipment also were shown.

Milwaukee Foundry Equipment Co., Milwaukee, showed a jolt squeeze stripper molding machine, two jolt squeezers, a jolt machine equipped with four lifting pins which serve to lift the mold from the table, and a power driven jolt roll-over pattern draw machine. In addition to the various molding machines in the booth occupied by the Wm. H. Nicholls Co., Inc., Richmond Hill, Long Island, N. Y., the company also displayed a dismembered machine to illustrate the sturdy construction and the fine finish on the various operating parts.

Beauty and utility were combined in the extensive display of the Osborn Mfg. Co., Cleveland, where the various machines on display were finished in white enamel. Another modern note in exhibition technique was presented in a talking figure of an old time foundryman extolling the merits of a core blowing machine. Part of the lecture synchronized with the motions of an operator making cores on a coreblowing machine in the immediate vicinity.

An eye attracting feature of the booth occupied by the SPO, Inc., Cleveland, was a new molding machine decked out in irridiscent colors by dusting metallic powder over a newly painted surface. A number of other machines in more sober colors on the floor of the booth presented several new features. Vibrators under the table oscillate the sand while the mold is pressed against the squeezing head thus insuring proper density of sand in all parts of the mold.

In addition to several types of molding machines the Tabor Mfg. Co., Philadelphia, showed two disk cut-off machines and a dust collector unit. The cut-off machines are equipped with thin abrasive disks suitable for removing gates and risers from castings and for many other miscellaneous uses in the foundry.

Show Operating Model

Pieces of foundry equipment shown by the Allis-Chalmers Mfg. Co., Milwaukee, included vibrating screens, feeders, shakeouts, cupola blower, motor and control. An operating model showed the application of a shakeout sand handling and preparation unit.

Blystone Mfg. Co., Cambridge Springs, Pa., showed a sand mixing unit in which the sand first is introduced to a revolving screen mounted above the mixing pan. In the pan the sand and any incorporated material is mixed and blended by a series of shovels or paddles mounted in staggered order on a revolving shaft.

In a sand mixing unit exhibited by the Clearfield Machine Co., Clearfield, Pa., the pan revolves while the revolving rollers remain in the same fixed position. A pillar with a star shaped attachment at the bottom agitates the sand before it passes under the rollers.

In a batch mixer displayed by the Lancaster Iron Works, Inc., Lancaster, Pa., the pan revolves in one direction while the single roller travels in the opposite direction. The entire unit is enclosed and may be piped to a dust exhaust system. Sand is fed through an opening in the top from a bucket loader and glass windows are provided on diametrically opposite sides. Motor driven suspended riddles in four different sizes were shown at the booth of the Great Western Mfg. Co., Leavenworth, Kansas. The company also had on display a laboratory type sand sample sifter.

A new unit drive incorporated in the base of the machine was featured by the National Engineering Co., Chicago, in connection with an 8-feet diameter sand mixing machine capable of handling 3000 pound batches of sand and delivering the finished product at the rate of 40 tons per hour. Weights of rollers in this type mixer vary from 2200 to 5500 pounds, depending on the character of the sand to be treated. It is claimed this type of mixer may be adapted either to batch or continuous mixing on approximately a 2-minute cycle. A vibrating screen through which the sand falls on to a belt traveling over a magnetic pulley for the removal of small pieces of iron was shown. A laboratory or experimental type of muller also was on display. Enlarged photographs of sand mixers, screens and elevating equipment made by the Standard Sand & Machine Co., Chicago, were displayed in this booth.

A new portable type shakeout and sand conditioning unit was shown in operation by the Royer Foundry & Machine Co., Kingston, Pa. Sand and castings are separated at the shakeout. Sprues, scrap, gaggers, nails are removed from the sand before it passes through the familiar type rotary brush and belt type of sand conditioner developed by the Royer company.

A gyrating shakeout and portable screening and sand conditioning

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units were operated in the booth of the Simplicity Engineering Co., Durand, Mich. Woven wire screens, shakeout screens, electrical and mechanical vibrating screens, ro-tap testing sieve shaker and testing sieves, rotary driers and electric vibrators were displayed in the booth of the W. S. Tyler Co., Cleveland.

Chaplets in practically endless variety were displayed attractively in booths maintained by the Angell Nail & Chaplet Co., Cleveland; the Combined Supply & Equipment Co., Inc., Buffalo; and the Fanner Mfg. Co., Cleveland. An attractive table in front of the Angell Nail & Chaplet Co., booth was in the shape of a giant stud chaplet, square head and foot approximately 30 inches each way and supported on a stem about 9 inches in diameter.

Display Plaster Molds

Interesting displays of plaster molds and pressure casting in the production of pattern plates were presented by the Scientific Cast Products division Art-in-Bronze Co., Inc., Cleveland; Di-Mold Corp., Dayton, O.; Reliable Pattern & Casting Co., Cincinnati; and Sims Matchplate Co., Syracuse, N. Y. In this method molds of the master pattern are reproduced as many times as necessary in plaster blocks. The blocks are assembled in a flask. Thickness strips are placed between the edges as in making any matchplate mold. Metal then is introduced under pressure. In one instance the alloy base is the usual No. 12 aluminum with the addition of 1.00 per cent tin and up to 8.00 per cent silicon. The plaster molds are made from a mixture of plaster, asbestos fiber and marble dust. The molds are first air dried and then dried for a period of 18 to 24 hours in an oven at a maximum temperature of 350 degrees Fahr.

Products of the J. D. Wallace & Co., Chicago, and the R. L. Carter division of the Stanley Works, New Britain, Conn., were shown in operation at the extensive booth representing some of the foundry and pattern shop activities of the Cleveland Trade school. A radial saw, universal saw, jointer, lathe and band saw were shown by the former company. The latter company showed portable and stationary electric routers and shapers.

Examples of pattern lumber, white pine and mahogany were shown at the booths of the Dougherty Lumber Co., Cleveland, and the Freeman Supply Co., Toledo, O. Dougherty Lumber Co. also featured an asbestos and magnesium lining material for flasks and bottom boards.

Haskelite Mfg. Corp., Chicago, featured a new material for pattern plates and matchplates. The material is a plywood faced on both sides by thin steel sheets. Advantages claimed by the material are light weight, warpproof and great strength. Kindt-Collins Co., Cleveland, showed pattern letters, pattern wax, fillets and other items of pattern supply and equipment. Also a double unit aluminum melting furnace and three disk grinders and sanders.

Smith & Richardson Mfg. Co., Geneva, Ill., displayed an extensive line of chaplets, hinge tubes and a wide variety of other tin forms employed to facilitate molding a great variety of castings. A new development is a tin form to fit over the tip of a wedge gate. A small wing on each side anchors the form in the sand when the wood or metal gate block is withdrawn.

Various types of melting equipment were exhibited by Pittsburgh Lectromelt Furnace Corp., Pittsburgh, also a wide assortment of photographs of furnaces in operation in various foundries. Manual and automatic air-weight control used with the cupola blower as well as the multi-stage centrifugal type turbo-compressor were demonstrated at the booth of the Spencer Turbine Co., Hartford, Conn. The company also exhibited for the first time a new industrial portable vacuum cleaner of light weight construction but powered to do fast work in handling foundry cleaning problems.

Lava Crucible Co. of Pittsburgh, Pittsburgh, showed refractories for brass foundry and special alloy furnaces, including ring linings; furnace covers, base blocks and brick, ramming plastic mixes and furnace cements; silica carbide, fused alumina and mullite. Detroit Electric Furnace Co., Detroit, displayed its units by photographs. Monarch Engineering & Mfg. Co., Baltimore, had available for observation a crucible that had melted 52,000 pounds of bronze in 525-pound heats at 2450 degrees Fahr. The company also demonstrated tilted crucible furnaces, stationary crucible furnaces, double ladle heater, turbine motor blowers and oil pumps and motors.

Whiting Corp., Harvey, Ill., had available for examination a U-shaped ladle for desulphurizing cupola iron. It also showed for the first time an insulated covered ladle. The company operated models of cupola charging equipment designed to reduce cost and speed production. An illuminated panel in the background of the booth depicted two types of hot blast cupola. International Graphite & Electrode Corp., St. Marys, Pa., demonstrated electrodes for electric furnace application.

Show Crucibles and Refractories

Joseph Dixon Crucible Co., Jersey City, N. J., had graphite and clay crucibles, ladle stoppers and nozzles available for inspection. Electro Refractories & Alloy Corp., Buffalo, exhibited crucibles, special alloys and furnace linings and demonstrated high-thermal conductivity crucibles. Vesuvius Crucible Co., Swissvale, Pa., had a wide variety of crucibles on display for melting ferrous and nonferrous metals. Many special shapes were shown as were stopper heads and nozzles.

Foundry Equipment Co., Cleveland, had two gas-fired core oven units in operation; one a continuous tower core oven equipped with a recuperative heating system; the other operated with an external reheating system equipped with an automatic spark ignition and with all work subjected to the same temperature. This company also showed a rolling door type oven with automatic controlled gas burners and safety equipment. American Crucible Co., Shelton, Conn., exhibited base stools, teeming pots, furnace covers, cement, test ladles, stirrers and skimmers and various type crucibles.

Zippler Tuyere Systems, Pittsburgh, showed a cut-away tuyere section claimed to produce hotter iron for the same coke ratio of coke to iron. A cylindrical tap ladle, balanced and built with a

President

MARSHALL POST, whose election as president of American Foundrymen's association was announced at its annual business meeting, May 18, is vice president and general manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

Mr. Post was born in San Antonio, Texas. He has had an extended career in the foundry industry, beginning as an apprentice molder with the American Steel Foundries, Granite City, Ill. His apprenticeship lasted 3 years and following completion of the course, he became a journeyman molder with the Commonwealth Steel Co., Granite City. Later, he became associated again with the American Steel Foundries, first as assistant foreman, then as night foreman and finally as foundry superintendent.

In 1918, he accepted a position as superintendent of foundries, Marion Steam Shovel Co., Marion, Ohio, but returned to the American Steel Foundries in 1920 as works manager of the Sharon, Pa. plant of that company, and later as works manager of the Thurlow plant, Chester, Pa. Since 1925, Mr. Post has been vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

clutch brake and planetary gearing for tipping was the center of attraction at the booth of the Modern Equipment Co., Port Washington, Wis. A cupola charger was shown in photographic form. Campbell-Hausfeld Co., Harrison, O., showed a new multiple burner melting furnace for the first time and also had available for inspection a melting furnace equipped with a blower which is an integral part of the furnace and mounted on the side.

Carl-Mayer Corp., Cleveland, employed photographs to depict a line of core and mold ovens of the portable, shelf, rack, car and conveyor types including vertical, monorail and horizontal units. A thermo syphon system for baking cores and molds was explained by a large oven and actual chart record for each oven load at the booth of the Willsea Works, Rochester, N. Y. Large cores and small cones of core material baked in the same oven overnight at 430 degrees Fahr. were on display to demonstrate the effectiveness of the company's unit.

Material Moving Equipment

Automatic electric trucks featuring ease of control and durability were shown by the Automatic Transportation Co., Chicago. A breaker-type, double-surfaced revolving screen for foundry sand was featured by the C. O. Bartlett & Snow Co., Cleveland. Other items exhibited by that company included sand and mold-handling equipment. Chain Belt Co., Milwaukee, showed models of a mold car and an apron conveyor. Core barrows and core transports equipped with balloon tires were exhibited by the Chicago Mfg. & Distributing Co., Chicago.

A 3-ton platform truck was shown by Clark Tructractor, Battle Creek, Mich. This truck is of the lift type. Safety is a feature of the pull hoists shown by the Coffing Hoist Co., Danville, Ill. Dodge Mfg. Co., Mishawaka, Ind., exhibited a section of a roller conveyor system and a roller bearing convevor belt idler. The power-operated fork truck shown by the Elwell-Parker Co., Cleveland, is provided with forks which pick up the load, elevate it and incline it backward for transportation.

Harnischfeger Corp., Milwaukee, showed variable speed control hoists in several models, also welding electrodes. A complete electrically operated sand-handling system was exhibited by the Jeffrey Mfg. Co., Columbus, O. Jones Conveyor Corp., Newark, N. J., exhibited a moving pipe line for conveying sand or abrasive materials. A complete foundry sand-handling system was shown by the Link Belt Co., Chicago. Speed reducers in various models and sizes were a feature of the exhibit of Howard M. Metz, Cleveland.

Palmer-Bee Co., Detroit, exhibited a section of a foundry mold conveyor in operation. Variable speed controlling equipment in various models was shown by the Reeves Pulley Co., Columbus, Ind. Republic Welding & Flame Cutting Co., Cleveland, exhibited a book-type core machine for making cores on a high-production basis. A spring mounted roller conveyor designed to eliminate shocks and jars was shown by the Standard Conveyor Co., North St. Paul, Minn.

Various safety appliances on exhibition reflected progress made during the past few years toward reducing hazards. Mine Safety Appliances Co., Pittsburgh, exhibited and demonstrated a full line of safety equipment. One of the most interesting items was an abrasive mask to protect the operator in sandblasting operations. Shoes scientifically designed to prevent foot accidents in foundries were shown by the Safety First Shoe Co., Holliston, Mass. Safety Clothing Co., Cleveland exhibited clothing designed to give full protection to the body in sand-blasting, foundry grinding, etc.

Goggles designed to promote safety while chipping, grinding, welding, etc., in present-day foundry practice were featured by the Safety Equipment Service Co., Cleveland, together with a general line of accident prevention equipment for every industry. Standard Safety Equipment Co., Chicago, featured washers for grinding wheels. These washers are designed to prevent wheel fragments flying in case a wheel is fractured through accident. Protection equipment to guard workmen against industrial eye hazards constituted the display of the American Optical Co., Southbridge, Mass. Among this were glasses, goggles and helmets. Shown for the first time was a new respirator.

Equipment for measuring and controlling temperatures was featured by three companies. A simplified optical pyrometer with standard calibrated and red correction scales was shown by the Pyrometer Instrument Co., New York. Other types included immersion pyrometers for nonferrous metals, and radiation and surface models. Indicating, recording and controlling instruments for use in connection with pyrometers and pressure gages were demonstrated by the Foxboro Co., Foxboro, Mass. Attracting attention of visitors was an air-weight controller developed for use with cupolas.

Show Many Testing Devices

A new shock-proof type of indicating instrument was shown by the Illinois Testing Laboratories Inc., Chicago, in connection with several models of pyrometers and electric resistance thermometers. Demonstrated was a direct-reading air velocity meter for use wherever air regulation is necessary. Detection of tramp iron or steel in various materials and products was being performed by an electro-magnetic device.

Several companies exhibited testing and inspection equipment depending upon optics for its functioning. A complete line of microscopes and equipment for metallographic work was featured by the Bausch & Lomb Optical Co., Rochester, N. Y. Included was spectrographic apparatus and a new type of instrument for checking the contours of gear teeth, etc.

Metallurgical microscopes, grinding and polishing machines for metallurgical specimens, dilatometers and photographic equipment were on display in the booth of E. Leitz Inc., New York. A metallographic outfit for bright field, dark field and polarized light, was shown by Carl Zeiss Inc., New York, in addition to microscopes and spectroscopes for material inspection. Of interest was a photometer for metal analysis and a new device for accurate measuring of indentations in the brinell, Rockwell and Vickers hardness tests. Optical instruments and metallurgical apparatus used in foundry research laboratories were shown by Adolph

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Vice President

HENRY S. WASHBURN, elected vice president of the American Foundrymen's association, was born in Brooklyn, N. Y. After receiving his early education at St. Paul's School, Garden City, N. Y., he attended Yale university.

Mr. Washburn's first commercial position was bookkeeper with the Corn Exchange Bank of New York. From 1906 to 1917 he held various positions as clerk, credit man, and officer manager with the D. L. & W. R. R., H. B. Claflin Co., and Butler Bros. of New York City. From 1917 to 1921, Mr. Washburn was purchasing agent, Turner & Seymour, Torrington, Conn. Since 1921, he has been president and treasurer of the Plainville Casting Co., Plainville, Conn.

Mr. Washburn has been greatly interested in foundry technical association work, is a member of the Connecticut Foundrymen's association, National Founders' society, and the Gray Iron Founders' society.

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I. Buehler, Chicago. In addition to microscopes, this included various types of grinders and polishing machines for preparation of specimens.

Machines and apparatus for examination and testing foundry sands comprised the principal part of the display of Harry W. Dietert Co., Detroit. With this equipment it is possible to determine physical properties of sands for molds and cores. That company also showed equipment for making the analysis of metals, ores and chemicals, with considerable speed. Included was an applied research laboratories spectrograph. Apparatus for making instantaneous moisture determinations of foundry sands was demonstrated in the booth of the Alpha-Lux Co. Inc., New York. The company also showed material for adding to molten iron and steel to promote soundness in the castings or ingots. Another product was a monolithic lining materials.

A number of companies displayed refractories employed in foundries. Among these was the Pyro Clay Products Co., Oak Hill, O., with a line of standard and special shapes, plastic fire brick, and high temperature cement. One of the newly introduced shapes was a large pouring spout brick for tapping iron into several ladles without stopping the flow from the cupola.

Exhibit Refractory Lining

Cleveland Quarries Co., Cleveland, showed samples of silica firestone employed as linings for cupolas, mixers and air furnace bottoms, as well as for blast furnaces, bessemer converters, soaking pits, forge furnaces and acid tanks. Refractories in a wide variety of standard and special shapes were exhibited by the Mullite Refractories Co., Shelton, Conn., in addition to several grades of ramming cements. Ramtite Co.. Chicago, also featured refractory specialties. Set up on exhibit was a ladle with monolithic lining sutable for high-temperature irons. and an insulated mixer ladle with a combination of insulating brick and a monolithic lining.

Heavy and light welded steel flasks were on display in the booth of the Sterling Wheelbarrow Co., Milwaukee. The heavier types were fabricated from rolled channels and were amply reinforced. Other products included steel bottom boards and core plates; wheelbarrows with and without rubber tires; and hardwood wedges. Welded pressed steel flasks were exhibited by Black, Sivalls & Bryson Inc., Kansas City, Mo. Accessory equipment included bottom boards and pouring jackets. Hines Flask Co., Cleveland, showed new aluminum slip flasks and jackets produced by a semi-die casting method and claimed to be of sturdy construction.

Nearly a dozen firms displayed nonferrous metals and alloys. Ajax Metal Co., Philadelphia, Ajax Electric Furnace Corp., Trenton, N. J., exhibited an interesting and beautiful collection of statuary made from its bronze ingots. L. A. Cohn & Bro. Inc., Chicago, showed in addition to ingots, a number of gates of small castings. Federated Metals division, American Smelting & Refining Co., New York, displayed numerous alloy castings produced from ingots manufactured by that firm. Benjamin Harris & Co., Chicago Heights, Ill., also showed castings made from its ingots.

H. Kramer & Co., Chicago, displayed sectioned ingots, and micrographs to show the structure. R. Lavin & Sons Inc., Chicago, exhibited various types of ingot metal, and valve castings made from the metal. Michigan Smelting & Refining Co., Detroit, showed a number of photographs illustrating laboratory control in production of ingots. National Smelting Co., Cleveland, exhibited sample ingots. Arthur Seligman & Co. Inc., New York, displayed aluminum alloy ingots, and a number of sand and die castings made from similar metal. Niagara Falls Smelting & Refining Co., Buffalo, presented information on its products. White Bros. Smelting Corp., Philadelphia, exhibited samples of nonferrous shot metal, and ingots. Cleveland Flux Co., Cleveland, had a colorful display of numerous ores used in preparation of its fluxes, and samples of those fluxes.

A wide variety of foundry supplies was available for examination in a number of exhibits. Federal Supply Co., Cleveland, displayed a portable vibrating screen sifter, a paddle type mixing barrel for liquid facings, and samples of facings, bonds and chaplets. Hill & Griffith Co., Cincinnati, made available information on a line of samples. Hoffman Foundry Supply Co., Cleveland showed pyrometers, vibrators, flask pins, snap flasks, spray guns for dry and liquid materials, and a new core box draw machine.

Show Facing and Supplies

J. S. McCormick Co., Pittsburgh, had a novel display of an electrically operated robot which gave a continuous description of the line of products. Booth of S. Obermayer Co., Chicago, was arranged as a rest room for visitors. Frederic B. Stevens Inc., Detroit, exhibited samples of foundry facings and supplies, ladle bowls, cements, and a portable grinder. United Compound Co Buffalo, showed various types of vent wax.

United States Graphite Co., Saginaw, Mich., had an interesting display of a small, scale model of a cupola arranged so that it appeared in operation, and showed the method of adding graphite to the molten metal stream. Samples of graphite and core wash also were shown. E. J. Woodison Co., Detroit, made available information on its products.

Requisites of the foundry industry, core oil and binders were displayed by more companies than usual. At many booths, cores made with the respective companies' oils were shown. Products cast with them included parts for automobiles, airplanes, tractors and other farm implements, refrigerators, and electrical machinery. In many cases castings completed the picture.

American Gum Products Co. and Robeson Process Co., both of New York, featured core binders in a joint booth. Cores made with these products lined the front of the exhibit. Accompanying the display of cores by the Certified Core Oil & Mfg. Co., Chicago, were small signs indicating the plants where the oil had been used. Two kinds of binders, for iron and brass, respectively, were shown by Corn Products Sales Co., New York. Cores, principally used in casting automotive parts,

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Prize Winner

CHESTER MARZEC, 3438 East Sixty-sixth street, Cleveland, an honor student in the class of foundry apprentices at the Cleveland Trade school, and a roller skating page boy at the Panborn display, was winner of the first prize in the gray iron molding contest for foundry apprentices held during the recent foundry show. He is shown in the photograph holding his prize wining casting.

(*Continued from page* 100)

were exhibited by the company.

The attractive booth of the Dayton Oil Co., Dayton, O., displayed core oil in a barrel brightly painted to match the color of the furnishings. Cores for cylinder blocks and tractor parts were featured by Delta Oil Products Co., Milwaukee, Wis., whose oils and core washes had been used.

A puppet show which brought laughs at the booth of the Hercules Powder Co., Wilmington, Del., was entitled, "Lost in a Foundry," or, "Finding Gold in Black Sand," an "ironic comedy with an all-star casting." Cores and binders were displayed at the booth of the Oiless Core Binder Co., Cleveland. Visitors were invited to guess the weight of a steel casting mounted on a large scale. On the last day of the convention four judges found the casting weighed 1868 pounds.

Illustrate Use of Core Oil

Automobile cylinder castings in which the cores had been bonded with the company's oil were on view at the booth of Penola Inc., Pittsburgh. Cores accompanied each casting. Quandt Chemical Co., San Francisco, illustrated the use of its core oil. A large model of *Bill Gagger* greeted guests of Smith Facing & Supply Co., Cleveland. Displays of facings, and core wash flowing continuously from a barrel were other features.

An attractive back-drop welcomed visitors of Smith Oil & Refining Co., Rockford, Ill., to "Coreoil Gables." Cores shown had been made with the company's oil. Mementos of the convention were furnished by Werner G. Smith Co., Cleveland, at whose booth individual pictures of guests were taken. Swan-Finch Oil Corp., Detroit, displayed oil sand cores for all types of castings, and had an imitation revolving news ticker.

Three colored paintings illustrating various applications of molybdenum steels were shown by Climax Molybdenum Co., New York. Electro Metallurgical Co., New York, pointed out advantages of silicon, manganese and chromium briquets in the cupola. Castings designed to increase oxidation resistance at high temperatures and use of various alloying metals were shown.

International Nickel Co. Inc., New York, displayed two large animated circular charts. One showed different applications and characteristics of various nickel cast iron alloys, the other nickel brass alloys. A number of odd-shaped gears in operation formed an interesting focal point in this exhibit. A series of wall charts showing effects produced when vanadium was added in various amounts featured the exhibit of Vanadium Corp. of America.

Wide range of uses and advantages of alloy pig iron were emphasized by Bethlehem Steel Co., Bethlehem, Pa. Several Nash engine blocks of silvery alloy iron were shown with a wide variety of other complicated and intricate shapes. Featured in the exhibit of the Hanna Furnace Corp., Ecorse, Mich., was a huge iron pig. Its size was strikingly brought out by the colored background against which it was placed. Exhibit of Pickands Mather & Co., Cleveland, featured 40-pound pigs in an animated display. Samples of foundry coke were shown also.

Many small cast conduit fittings, several intricate engine block castings and a large centerpiece showing the pouring of molten metal from a ladle featured the exhibit of Republic Steel Corp., Cleveland. Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., exhibit included a miniature electric train in operation transporting and loading small ingots. Several cast iron gears, used without finishing, were shown. Small size pigs were highlighted, also.

Manufacture of Pig Iron

Wisconsin Steel Co., Chicago, had a 4-cylinder diesel-engine model in operation. It was cut away to show the cast iron cylinder liners used The background of the booth was arranged to represent molten iron tapped from a blast furnace flowing into a ladle. In the booth of Woodward Iron Co., Woodward, Ala., a large colored pictorial map showed the relative location of red ore mines, limestone pit, blast furnaces, pig machine buildings, by-product plant, coal washer plant, coal mines, and associated plants. Samples of various ferroalloys and a large wall map showing nine service points, from St. Louis to New York, were shown by Hickman, Williams & Co. Inc., Chicago. A large colored picture of the Anna furnace was a feature of the Struthers Iron & Steel Co., Struthers, O., exhibit. Many ore samples were shown also.

Foundry coke samples in two sizes of material were shown by Republic Coal & Coke Co., Chicago. Semet-Solvay Co., New York, presented samples of three different types of coke; including foundry coke, a special size foundry coke and core oven coke. Samples of foundry coke were cut into small squares, drilled and holes painted to resemble dice at booth of Wheeling Steel Corp., Wheeling, W. Va.

Producers and distributors of sands, clays and allied products brought many samples to make complete and interesting displays of the varieties and possibilities of sand in the foundry. With a background of photographs in color, Albany Sand & Supply Co., Albany, N. Y., showed its products of molding sand, gravel, steel molding sand, blast sand and silica core sand. Ayers Mineral Co., Zanesville, O., exhibited molding sand of many varieties and also silica sand for steel foundries, silica flour, core sand and rebonding clays.

Delhi Foundry Sand Co., Cincinnati, displayed a miniature fluorspar log washer showing how fluorspar for flux is cleaned. Molding sands, clays and bentonite were in the same display. Photographs showed the pits and plants at Eifort, O., of Eastern Clay Products Inc. whose chief product is bond clay. Core paste, fire clays and pitch were also featured. Native sand was used to cover each state of the Great Lakes district map which was the exhibit background of the Great Lakes Foundry Sand Co., Detroit. Molding, core, silica and blast sands were shown as well as silica flour, fire clay, bentonite, fire brick and clay bond.

Illinois Clay Products Co., Joliet, Ill., showed fire clay and bond clay flours, silica cement, fire brick, cupola blocks, ground fire clay and other fire clay products. Industrial Minerals Co., Lancaster, O., had a display of foundry sands, especially molding sand in three grades with specific clay content and also sands for bench and squeezer work. Photographs and samples showed natural bonded molding sands, fine sand for bench work, silica sands and fire clay and brick at the booth of Keener Sand & Clay Co., Columbus, O.

Sand in Wide Variety

Products emphasized at the booth of the Mt. Jewett Fire Clay Co., Mt. Jewett, Pa., included: Fire clay ground to certain sizes, bond for rebonding molding sands, fire clay for cupolas and ladles and treated clay for use in furnaces. Peerless Mineral Products Co., Conneaut, O., had an interesting exhibit of molding, core, silica and blast sands and also refractory clays, bonds, bentonite, cupola blocks and fire brick.

Pennsylvania Glass Sand Corp., Lewiston, Pa., had a large display of many types of foundry sands and silica flour. Attractively lighted display of George F. Pettinos Inc., Philadelphia, showed varieties of sands, gravel, insulating and refractory cements, flasks, foundry facings and binders. Sand Products Corp., Cleveland, miners and shippers of sand, had an interesting display of automotive, implement, stove and other types of cores. Insulating and asbestos cement featured the showing of F. E. Schundler & Co. Inc., Joliet, Ill., with certain talcs, magnesite, whiting and clays exhibited.

Taggart & Co., Philadelphia, test-

ed the expansion and contraction of sand at mold temperatures and had illustrations of the colloidal properties of its sands. Changing slides showed by map and chart the origin and variety of the molding, silica and blast sands and the gravel of Whitehead Bros. Co., New York. A turntable showed castings and examples of the sand used. Zanesville Sand Co., Zanesville, O., showed foundry sands, especially rock sand for light gray iron, brass and aluminum work.

Toledo Scale Co., Toledo, O., presented a cutaway scale indicating mechanism to show its operation. Pivot point mechanism of platform scales and several other types of scales were shown. Exhibit of Edwin S. Carman Inc., Cleveland, included a blast-flowmeter and a cupola control gage, along with descriptive matter covering other types of control equipment.

Cutaway sections of foundry ventilators, metal sidings and skylights were featured in the booth of H. H. Robertson Co., Pittsburgh. Economy Tool & Machine Co., Muskegon Heights, Mich., had two wire forming machines in operation. A foot-controlled stainless steel industrial-type wash fountain, 4½ feet in diameter, was in operation at booth of Bradley Washfountain Co., Milwaukee. A similar porcelain enameled unit, a cast stone washfountain and a steel, group shower also were shown.

Linde Air Products Co., New York, displayed and demonstrated several types of oxyacetylene flame-hardening equipment. Flame softening and riser removal were demonstrated. Complete laboratory setup and field equipment for evaluating occupational disease and industrial hazards were shown by Employers Mutual, Wausau, Wis. Standard ventilating setup for a grinder wheel as outlined in new A.F.A. ventilating code was a feature of the exhibit.

Exhibit of Dings Magnetic Separator Co., Milwaukee, included a working model showing operation of a magnetic pulley, a full-size lifting magnet with a capacity of 10 tons of billets, and a large high-intensity air-cooled magnetic pulley cut away to show internal construction.

Jackson & Church Co., Saginaw, Mich., had a large shakeout with a 3½ x 8-foot working area operating in their booth. A new type of pneumatic tamper was shown in operation with other air-driven vibrator units by the New Haven Vibrator Co. Inc., New Haven, Conn. A hose clamp, just recently developed, requires only one rib on the air hose fitting to make a connection that cannot blow off. South Bend Lathe Works, South Bend, Ind., demonstrated its latest types of engine lathes, featuring speeds, feeds and ease of control.

German Foundrymen Hold Conference

A number of interesting papers were presented at the technical conference held at the Technical college, Aachen, Germany, Feb. 24 to 26. The meeting opened with a reference by E. Piwowarsky to an investigation conducted in co-operation with H. A. Nipper on the relation between the melting practice on silicon-aluminum alloys and the characteristics of the resulting cooling curves. G. Guertler and F. Schmid, Metallgesellschaft, Frankfort am Main, described an investigation on the fatigue resistance of alloys of the silicon group in which they found that the addition of 0.4 per cent titanium to the 10 per cent aluminum alloy resulted in a 10 to 15 per cent increase. With 6 per cent and 12 per cent silicon alloys no adequate effect was observed.

L. Herrmann, Duerener Metallwerke, spoke on Shrinkage and Contraction of Aluminum Alloy Castings," while Phillip Schneider of the same firm talked on strains in cast aluminum parts. Melting procedure for magnesium alloys was the topic of a paper by K. Aschenbach, foundry institute, Technical college, Aachen. W. Wolf, Bergwerksgesellschaft Georg von Giesche's Erbern, Berlin-Steglitz, spoke on "New Advances in the Field of Zinc Alloys."

K. Roesch, Bergische Stahlindustries, Remscheid, in his paper on chromium cast steels pointed out that they could be divided into 4 groups or classes. The first containing from 0.12 to 0.35 per cent carbon, 0.80 to 2.0 per cent chromium, and 0.25 per cent molybdenum. The second containing 0.15 to 0.25 per cent carbon, 1 to 6 per cent chromium, and 0.50 per cent molybdenum. The third class contains 0.15 to 0.60 per cent carbon, and 6 to 16 per cent chromium while the fourth class contains 0.15 to 0.25 per cent carbon, and 14 to 16 per cent chromium. His paper was followed by one prepared by Harald Bruhn, Deutsche Metallwerk, Duisberg-Meiderich, on the influence of lead on the properties of cast iron.

Prof. Piwowarsky then discussed the theoretical and practical significance of graphite formation in cast iron. R. Bertschinger, foundry institute, Technical college, Aachen, spoke on the relationship between damping capacity and structure of gray iron as well as the mechanical and elastic properties of cast iron. "Melting Process in the Cupola" was the topic of a discussion by H. Jungbluth, Friedrich Krupp A. G., Essen.

Dr. Maurmann, economic committee, Giesserei-Industrie, reviewed briefly the organization of industrial economy. Dr. Geilenkirchen, Duesseldorf, gave a lecture on "Operation Comparisons in Iron Foundries." Prof. H. A. Nipper, Empire educational minister's staff, presented an interesting talk on his visits to various iron and metal foundries in the United States. J. H. Kuester, Humboldt-Dietz-Motoren A. G., gave a review of the present status of technique and efficiency in American foundry methods.

Book Review

Testing and Grading Foundry Sands and Clays, published by the American Foundrymen's association, and supplied by THE FOUNDRY, Cleveland, for $4.00 and in Europe by the Penton Publishing Co. Ltd., London.

This is the first revision in the past 7 years, the third edition having been published in 1931. It represents the work of the committee on standard tests of the American Foundrymen's association foundry sand research committee, which is composed of the following individuals: Dr. H. Ries, chairman, Cornell university, Ithaca, N. Y.; E. J. Ash, University of Michigan, Ann Arbor, Mich.; H. L. Daasch, Iowa State college, Ames, Iowa; Horace Deane, Deere & Co., Moline, Il.; A. H. Dierker, Ohio State university, Columbus, O.; H. W. Dietert, Harry W. Dietert Co., Detroit; N. J. Dunbeck, Eastern Clay Products Co., Eifort, O.; E. H. King, Houghland & Hardy Sand Co., Evansville, Ind.; L. B. Knight Jr., National Engineering Co., Chicago; C. Mathiesen, Whitehead Bros. Co., Albany, N. Y.; C. P. Randall, Hunt-Spiller Mfg. Corp., Boston; W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J.; C. M. Saeger, Jr., Federal Bureau of Standards, Washington; W. M. Saunders, 184 Whittier avenue, Providence, R. I.; and Stanton Walker, National Industrial Sand association, Washington.

The new edition is enlarged, contains many new tests for sands and clays and, in fact, is the first publication containing testing methods for foundry clays. In all, 16 standard and 17 tentative standard methods are listed as well as one recommended method. The material has been revised throughout to conform to a standard outline and description at the end of the book. The book also contains an extensive table of contents and a cross index of material for ready reference.

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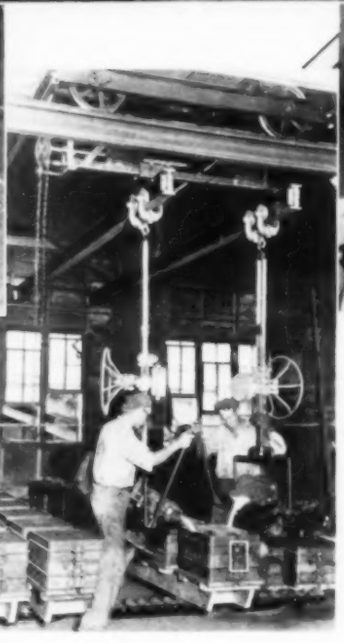

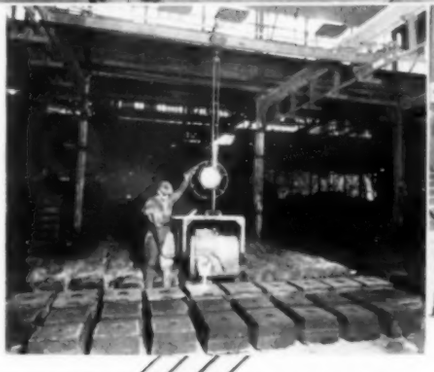

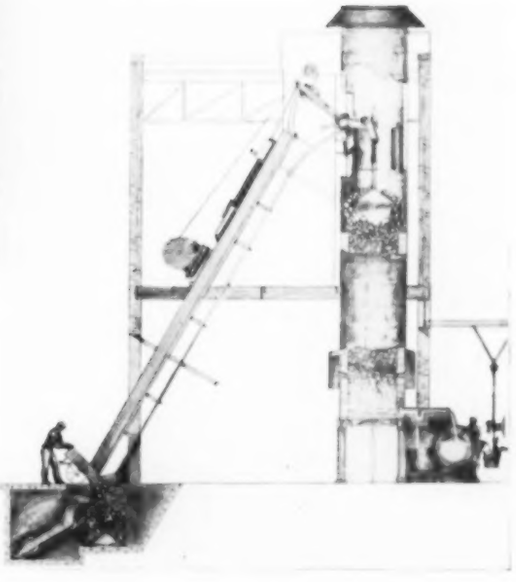

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OBITUARY

JOHN H. EASTHAM, 63, connected at various periods during the past 30 years as foreman in foundries in United States and Canada, died March 25 at his home in Montreal. Other connections included the Penton Publishing Co., and the Federal Foundry Supply Co., Cleveland. The late Mr. Eastham was born in Preston, England, Feb. 15, 1875. After learning the molding trade he worked for several years in British foundries before going to Canada in 1910. He was a frequent contributor to THE FOUNDRY and other publications of articles dealing with many phases of practical foundry operation.

* * *

Adolph Mathieu, president, Mathieu & Sons Foundry Co., Bridgman, Mich., died recently.

* * *

Joseph Vogt, 69, president, Schueler Brass Foundry Co., Newark, N. J., died recently after a brief illness.

* * *

Bernard H. Garhart, 44, president, B. H. Garhart Foundry Co., Kansas City, Kans., died recently. He formerly was associated with the Petroleum Iron Works, Sharon, Pa.

* * *

John S. Baker, 68, president, Baker Mfg. Co., Evansville, Wis., and noted inventor in the field of agricultural tools and farm equipment, died April 14.

* * *

Louis B. Merrill, 79, former vice president of the Beloit Iron Works, Beloit, Wis., and its predecessor, the Merrill & Houston Iron Works, died recently. He had retired about 10 years ago.

* * *

Carroll M. Towne, 82, for many years general manager of the former Clinton Burnham Foundry Co., Milwaukee, died recently. He was a native of Vermont and went to Milwaukee in 1892.

* * *

Robert J. McNamara, former superintendent, McNamara - Koster Foundry Co., Indianapolis, died recently. Mr. McNamara's father founded the McNamara-Koster Foundry Co. in 1898.

* * *

John Nellis Klock, one of the founders of and president of the Benton Harbor Malleable Industries Inc., Benton Harbor, Mich., and president of the Muncie Malleable Foundry Co., Muncie, Ind., died in Chicago on May 7. He was born in Brier Hill, N. Y., in 1866, and in his boyhood worked as a printer and newspaper reporter. He went to Michigan in 1888, and purchased what now is the *Benton Harbor News-Palladium*, of which he was publisher. Mr. Klock was a former mayor of Benton Harbor, and presented that city with its publicly owned beach known as Jean Klock park.

* * *

Charles A. Swallow, superintendent, Richmond Malleable Iron Co., Richmond, Ind., died recently in that city. Mr. Swallow had been connected with that organization for the past 10 years. Previous to that he had been superintendent of the

Charles A. Swallow

Acme Steel & Malleable Iron Co., Buffalo, for 18 years. His other connections in the foundry industry included the Fanner Mfg. Co., and the Chisholm-Moore Hoist Corp., Cleveland. Mr. Swallow started his career as a superintendent in malleable iron with the Dayton Malleable Iron Co., Dayton, O.

* * *

Edwin Jory, foundry superintendent, National Transit Pump & Machine Co., Oil City, Pa., for the past 22 years, died April 10 at his home in that city. He was well known throughout the foundry industry, having gone to Oil City from Ballston Spa, N. Y., where he was associated as foundry superintendent with the Davison-Namack Co.

* * *

John C. Tobien, 89, superintendent of the old Cleveland Malleable Co., Cleveland, and owner of the Ohio Foundry Co., died April 24 at his home in Cleveland. Mr. Tobien, a widely known figure in that city for 30 years, in the manufacture of iron, steel castings and equipment, went to Cleveland 60 years ago from Naugatuck, Conn. to assume the superintendency of the Cleveland Malleable Co. Prior to purchasing the Ohio Foundry Co. nearly 45 years ago, he was superintendent of the Eberhardt Mfg. Co. for several years. Selling the foundry after a number of years, he later bought the Brightman Machine Co., which also is out of existence. Mr. Tobien retired shortly before 1910.

* * *

Thomas N. Kurtz, 55, a leader in the refractories industry, and vice president of North American Refractories Co., Cleveland, died April 21 in Pittsburgh. Mr. Kurtz organized the Standard Refractories Co., Claysburgh, Pa. in 1913 and acted as general manager of the company until 1922. Later he became president of the U. S. Refractories Corp., Mt. Union, holding that position until 1930 when the firm merged with the North American Refractories Co.

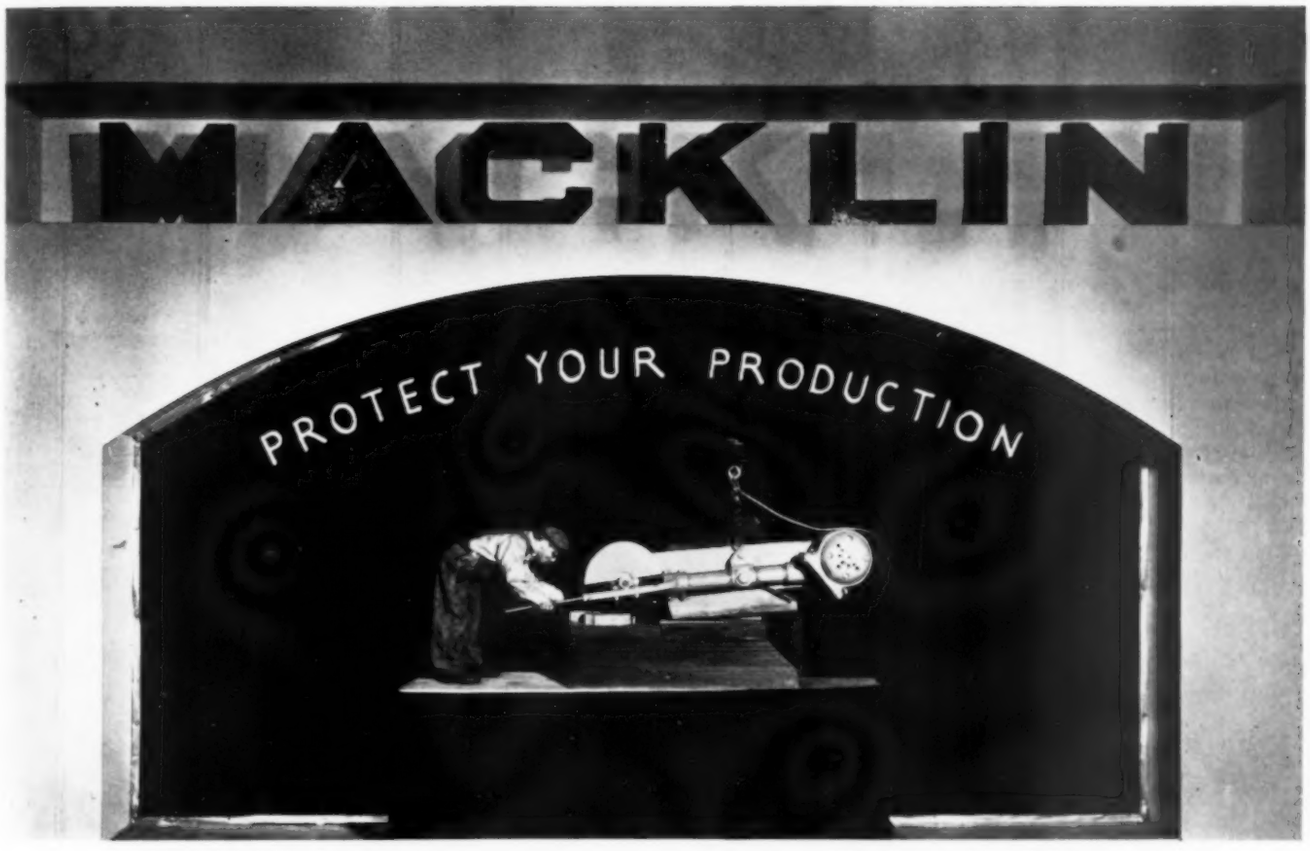
Book Review

Gmelins Handbuch der anorganischen Chemie, Eisen, Teil C-Lieferung 1 (Gmelins Inorganic Chemistry Handbook, Iron, Part C, Section 1), edited by the German Chemical society, paper, 162 pages, 7 x 10 inches, published by Verlag Chemie, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, and in Europe by the Penton Publishing Co., London.

This book, which is published in German, is another section comprising a monumental work on inorganic chemistry. This relates to hardness testing methods for iron and steel. It is divided into numerous parts covering all methods for hardness testing. The first discusses scratch hardness methods while the second describes static indentation. That is followed by information on dynamic hardness testing. Another section deals with pendulum hardness testing while another discusses special hardness testing methods.

Other phases covered in the book relate to hardness determinations on special materials, determining hardness at high and low temperatures, hardness testing machines, relation of hardness values to one another, relation between hardness and tensile strength, relation between hardness and elastic limit, relation between hardness and mechanical properties, and a critical review of commonly used hardness testing methods.

War department, office of the division engineer, North Pacific division, 523 Pittock block, Portland, Oreg., has prepared a publication entitled, "Preliminary Report on Some Northwest Manganese Deposits, Their Possible Exploration and Uses," by E. T. Hodge. It describes many of the low grade manganese deposits in southwestern Oregon and in the Olympic Peninsula, Washington. Also it discusses technology of low grade manganese ore production, uses and market for manganese, etc. Cost of the volume is 75 cents.



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Melting Nonferrous Metals

(*Concluded from page* 34)

this uniformity of temperature necessarily operates to make the lining last longer. As soon as the charge is melted and has reached the desired temperature for pouring, a ladle or crucible is placed in position to receive the metal poured from the furnace and this ladle or crucible is carried to the molds. These should be preheated so as not to cool the metal poured from the furnace. Temperature of the metal left in the furnace between taps is maintained by occasionally turning on the flame.

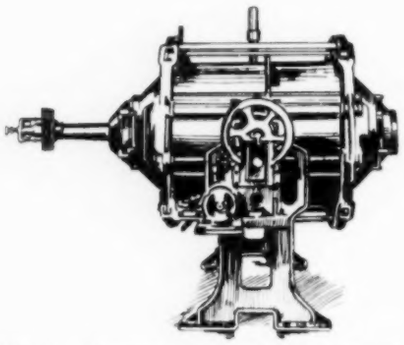

Fig. 2—Furnace on trunnions permits tilting in any desired position

In operating any reverberatory furnace the atmosphere should be such as to avoid gas absorption by the metal which comes in contact with the products of combustion. Therefore, a proper flame must be maintained so as to insure the complete combustion of the fuel. In fact, it is a wise precaution to have a slight excess of oxygen present. The small amount of metal lost in oxidation through that practice is preferable to a charge full of dissolved gases which produces spongy castings.

Another type of reverberatory furnace commonly used in the brass foundry is a sheet iron cylinder lined with refractory having an opening at one end through which the burner drives the flame, and another opening at one side of the cylinder through which the metal is charged and discharged. Some of these furnaces have the charging opening nearer the burner end than it is to the other, and some of them place this opening midway between the two ends of the furnace.

The furnace is designed so that it can be rotated about the axis of the cylinder and sometimes is provided with a motor driven mechanical device to rotate it back and forth so that the metal may be washed over as much of the refractory as possible without spilling out of the pouring mouth. Such a furnace is shown in Fig. 3 and the capacities range from 1000 to 3500 pounds of brass or bronze.

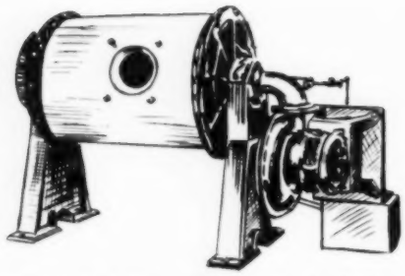

Fig. 3—Metal is washed over the hot refractory lining by rotating the furnace back and forth

As shown in Fig. 4 another similar type of unit consists of two furnaces so placed on trunnions that the exhaust flame from one furnace enters the second furnace and gives off a further amount of its heat to the second furnace before being exhausted. Either of the furnaces may be operated and poured independently. Capacities of the furnaces range from 250 pounds to 2000 pounds per chamber.

In operating the furnaces one chamber is charged first and as the metal becomes molten, the second chamber, having been preheated by the exhaust from the first, is charged. During the superheating of the charge in the first furnace, the charge in the second furnace is being brought to a molten stage. On reaching the desired temperature the charge in the first furnace is poured off, and the burner feeding the second furnace is lighted to give the maximum temperature to the charge it contains. Consequently, waste gases from this second furnace now are used to preheat the new charge in the first furnace from which a charge has just been poured.

Another type of reverberatory furnace is a cylindrical drum mounted on trunnions so that it may be rotated about the axis of the cylinder with burners at both ends as shown in Fig. 5. Capacities range from 500 to 24,000 pounds. The furnace has an opening on the side of the cylinder midway between the ends. The opening is provided with a swinging cover in which there is an opening through which the waste gases are ejected.

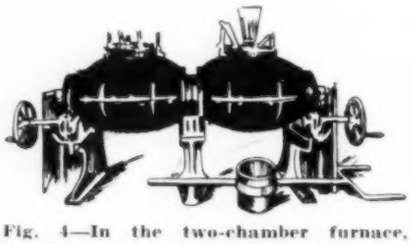

Fig. 4—In the two-chamber furnace, metal in one is heated by the exhaust flame from the other

The furnaces will operate on either gas or oil, but, the burners must be such as will deliver the proper combustion conditions for whatever fuel is provided. A common operating condition for such furnaces is to use fuel oil at about 30 pounds per square inch pressure and air at about 20 ounces per square inch pressure. Manufacturers of all the different types of reverberatory furnaces have made exhaustive studies of burner design, air pressures and oil pressures, and have arrived at certain recommendations that they feel to be desirable for their furnaces.

Manufacturers are prepared to cooperate with users in the interest of efficiency and economy. The question of refractory linings has been considered carefully. Preformed linings are supplied by some manufacturers for the furnaces. These come in the form of brick segments shaped to fit the furnace. They should be placed in the furnace with a minimum amount of cement between the different bricks, and the number of joints should be of the absolute minimum for it is at the joints that slagging away or spalling first develops.

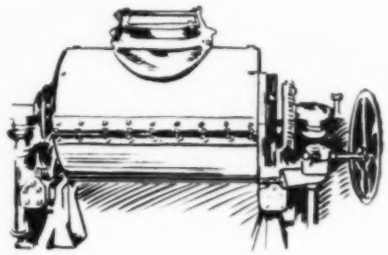

Fig. 5—Burners at both ends of this type of furnace are employed for supplying the necessary heat

For that reason some manufacturers recommend a monolithic lining rammed in place around a form and the furnaces are designed so as to permit ease of installation of such a monolithic lining. An important precaution in lining the furnaces is to insure proper alignment of burner orifices with respect to the axis of the furnace. In the case of one furnace having a burner at each end, it has been found desirable to have the orifices arranged so that the two flames pass each other. That causes a gyration of the flame throughout the furnace cavity and permits longer time for their circulation before being ejected from the furnace. In the operation of all these furnaces the flame should be watched carefully.

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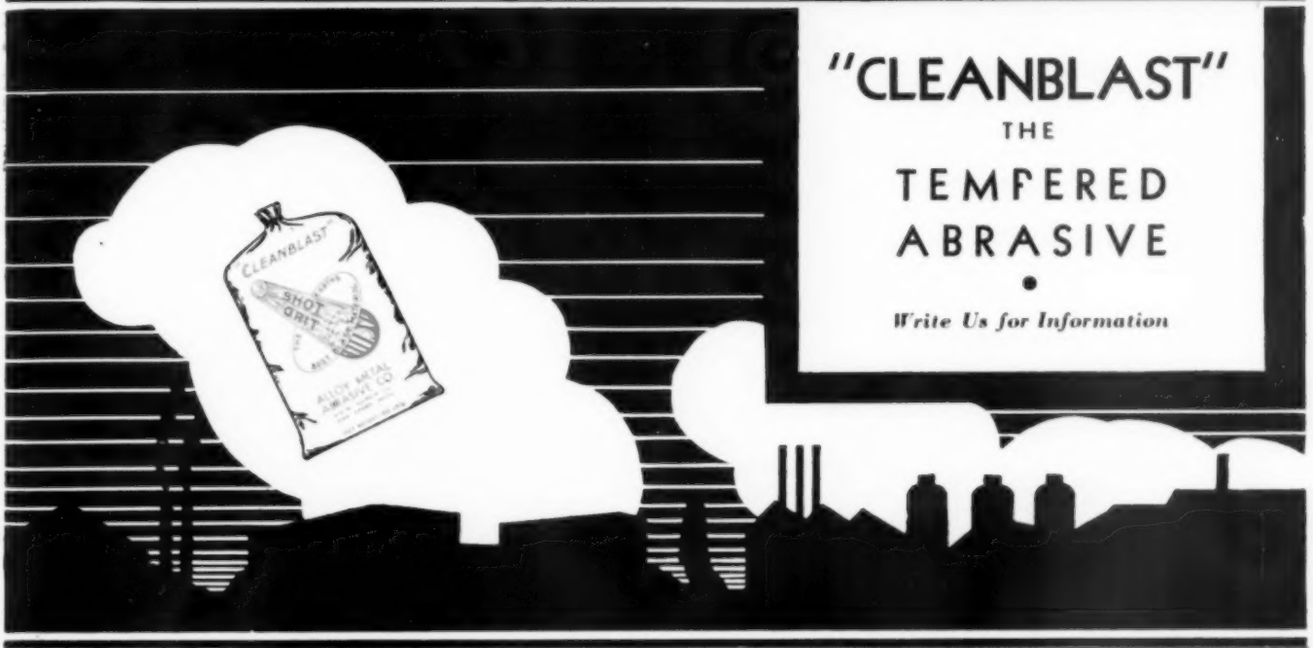

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Steel Foundry Practice

(*Continued from page* 37)

casting by the usual methods.

Molding and coremaking operations are not started until the various details pertaining to these operations have been studied. The attention given these details determines the degree of perfection of the resultant casting, assuming, of course, that the steel is made properly. Sometimes blame for failure to make good castings is placed upon the steelmaking department, although in most instances it rightfully belongs to the molding and coremaking departments where some detail necessary for production of a satisfactory casting has been overlooked.

Determination of the proper size and location of risers or heads on a steel casting is very important, but can be dealt with here only briefly. No definite rules can be prescribed in regard to the use of risers. Every design of casting is a separate problem. The ideal design, from the standpoint of easy and simple adequate feeding, is that of a wedge with the large end as the cope side. Castings of this design are rare, and therefore the steel foundryman must use considerable ingenuity and draw on his past experience when establishing the method for obtaining sound metal in various parts of a casting.

Molds May Be Tilted

Sometimes castings are poured on end to insure proper feeding, and sometimes molds are inclined while being poured. When using the latter practice, the riser may be at the higher level with the gate at the opposite end or lower level; or the riser and the gate may both be at the lower level with an air vent at the high point on the opposite end. If the second method is used, the position of the mold is reversed immediately after pouring so that the incline of the mold is in position whereby the hot metal in the riser and gate becomes the high point to permit feeding the casting.

Heavy sections of metal in the drag side of a casting must be fed with risers over them in the cores whenever practicable to use them. Such heavy sections when adjoining thinner metal sections on a higher level in the mold, present a problem to the steel foundryman. They thus become a feature of design just the opposite to the ideal design of the wedge with a riser on the wide end and having steel poured down the riser so that the last metal to enter the mold is in the riser and the steel in the mold solidifies progressively from the bottom to the top.

Slight changes in the design of a casting may be necessary to permit the steel foundry to obtain sound metal sections. For example, a heavy section or boss in a part of the casting difficult to reach with feeding risers might be cored out to reduce the metal thickness. When the location of a riser on the cope surface destroys the contour of design, the latter might be altered without affecting the serviceability of the casting.

It is obvious that the most economical cross-sectional shapes of risers are the circular or oval shapes. Metal is wasted in the corners of square or rectangular shapes. An apparently insignificant detail pertaining to shapes, but one which may eliminate unnecessary work in the cleaning room, is that of the contour of the mold at the junction between the riser and the casting. This point is frequently ideal for the occurrence of a shrinkage crack, unless a large fillet is formed in the mold. Sometimes brackets are necessary between the riser and the casting to prevent cracks in the casting at the base of the riser.

Removing the Risers

Ease of removal of risers is not always considered by the foundryman whose main purpose is to obtain sound metal sections. More thought given to the method of removing risers from castings usually will result in saving time and expense in the cleaning department. When risers can not be broken off or cut on the sprue cutter, they must necessarily be burned off with gas, which is much faster, although not necessarily cheaper than sawing. The less burning required the faster the casting will move through the cleaning department.

Risers and gates commonly are mentioned in the same breath. The latter are no less important than the former in producing good castings. In some cases, a pouring gate is not needed and molds can be poured through a riser when the mold is not deep and can be poured in this manner without splashing or destroying the mold surfaces. However, most castings require pouring gates, although they are sometimes necessary evils because they are the sources of casting troubles.

A gate usually is attached to a casting at a low point or on the drag surface. While the mold is being poured, the surface of the mold in the vicinity of the gate becomes heated to a very much higher temperature than other parts of the mold. In addition to this, the last metal to enter the mold is at the gate. Both these conditions cause the hottest part of the casting immediately after pouring to be at or near the gate. This is not infrequently the cause of shrinkage cavities in parts of a casting on the drag side, or at the junction between the gate and the casting. Wherever possible to do so, a gate is located near a riser in order that the feeding effect of the latter will prevent the formation of shrinkage cavities which otherwise might occur near the gate.

Benefit from the use of chills, either external or internal, is another important consideration when planning the manufacture of castings. Careful study of each design reveals when and in what parts of a mold, chills must be used to produce sound castings. In general, they are necessary in heavy metal sections which do not receive the feeding effect of the risers, although they frequently can be used to eliminate the need for a riser with a consequent saving in metal and in the cleaning department cost.

Intersections of parts of a casting often require chills to produce soundness at these points. Inside corners of pockets in castings are places where they are required. Bosses, flanges and other heavy sections of metal in the drag sides of castings usually have to be chilled in some manner to hasten the rate of solidification of the liquid steel after the mold is poured. Much attention has to be paid to this lower or drag part of a casting, because there conditions frequently are ideal for the solidification rate of liquid steel being slower than in the metal sections nearer the cope side.

Chills May Be Necessary

As previously mentioned, the drag part of the mold may be the hottest from the effect of the pouring gate, and the last steel to enter the casting is in the vicinity of the gate which is usually in the lower part of the mold. Hence the solidification of the liquid steel in heavy sections in the drag part of a casting, if not fed with risers, must be quickened by the use of chills if a sound casting is to be obtained.

No fixed rules can be advocated in regard to use of chills. Every design of casting has to be studied separately before the pattern and coreboxes are sent to the shop for molding and coremaking. Perhaps it can be said that steel foundrymen have made great progress in making castings having sound metal sections despite the intricacy of design. Importance of chills undoubtedly is familiar to every foundryman, and especially to those who

(*Concluded on page* 112)

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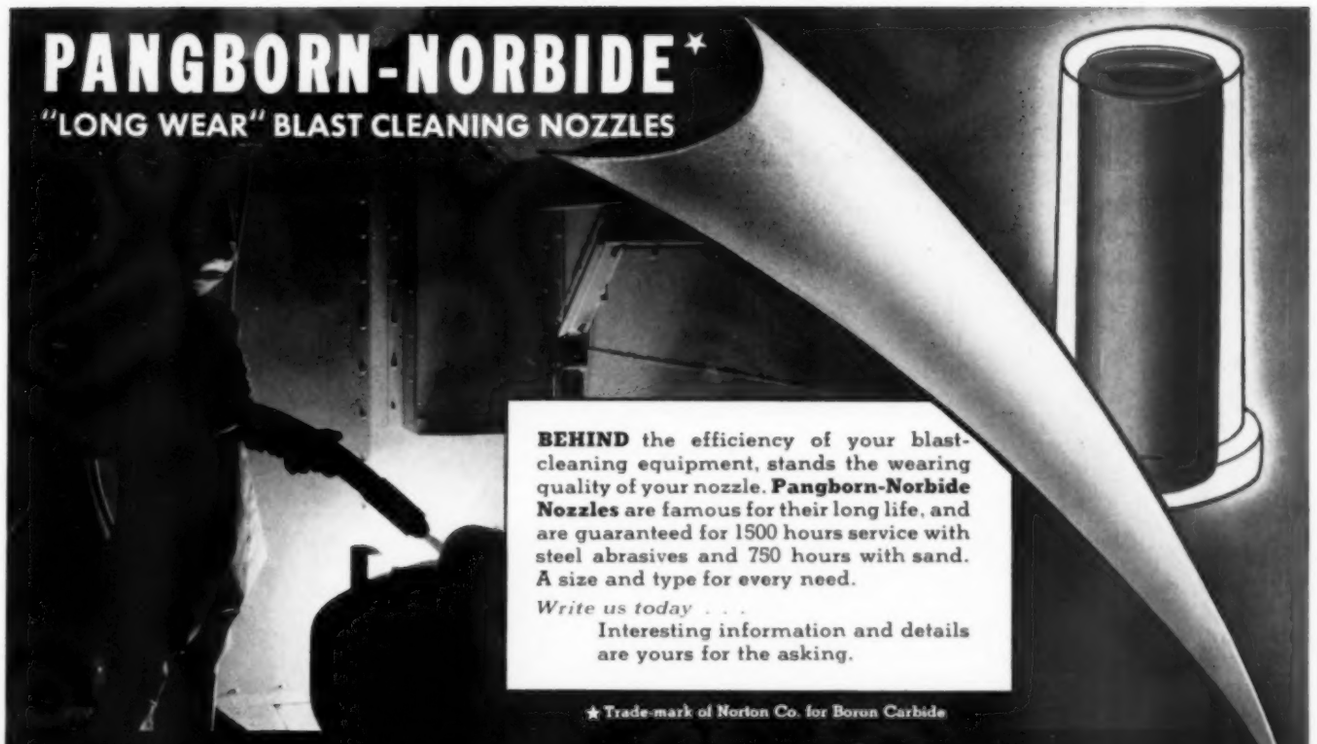

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(*Concluded from page* 110)

have had the experience of losing one or more castings due to neglect in using a chill at a certain point.

Use of brackets to prevent shrinkage cracks should be mentioned at least. They are used most commonly at angles where strains occur because shrinkage and contraction of the steel after a mold is poured is restricted by cores or parts of the mold. Being thinner than the members of the casting, they cool more rapidly and thus strengthen what would otherwise be weak points while the steel in the mold is at a temperature above 1300 degrees Fahr. The steel foundryman's past experience, imagination, logic and intuition, are usually the factors which cause him to decide when and where brackets are needed on a casting. This decision is best made at the time of planning the details of manufacture. It generally is more economical to have too many brackets than too few, because the cost of their removal is less than that of an imperfect casting.

Vent Certain Parts of Mold

Venting of a mold, other than that which is or should be done by a molder to permit the escape of core gases, is another point to be considered while preparing pattern equipment for molding and coremaking. Some designs of castings make venting certain parts of a mold desirable to provide an exit for air and gases formed while pouring. The mold may be filled so rapidly that air and gases, which can not pass through the walls of the mold or risers fast enough, become entrapped in pockets which form hollow areas near the surface of a casting.

They usually are covered with a thin film of steel and are not always visible on the surface. When these pockets are uncovered in the casting, they differ from shrinkage cavities in that they have a smooth oxidized surface, whereas the latter have a spongy or ragged surface. Adequate venting of such parts of a mold, along with more careful pouring of the steel into the mold, usually are the means for preventing these troubles.

Sometimes venting a mold at certain points materially aids the running of the liquid into thin sections and sharp edges. The air pressure set up in some parts of a mold while it is being poured probably has a tendency in some cases to retard the free flowing of the liquid steel into thin sections and sharp edges. Vents in certain parts of the mold seem to be helpful in many instances in preventing misrun metal sections.

Liquidity of molten steel and its duration is very brief after the steel enters the mold. While the steel is being poured it naturally flows in the direction of least resistance. Therefore anything done in the mechanics of molding which lessens resistance to a free flow of metal obviously will result in fewer misrun sections, assuming of course that the steel is in a fluid enough state when it is poured into the mold to flow into and completely fill all its parts without resistance.

A precaution taken at the time of preparing the procedure for making molds and cores from a specific pattern, pertains to the use of special sand mixtures or special treatment of them for exceptionally heavy metal sections. If a small core is surrounded by a heavy mass of metal, there may be difficulty in getting it out of the casting, unless the coremaker has been instructed to have a large vent in it and to make the core of a finer sand mixture, or to apply more than one coat of core wash.

Venting a core is no less important than the core sand mixture. The vent permits the core to collapse from the pressure exerted on it by the shrinking and contracting of the hot steel surrounding it. Without this provision, the core would be bound tightly into the casting. This same condition occurs in parts of the mold, where pockets of sand are held tightly between the walls of the casting due to the shrinking of the steel, unless there are some means for permitting a less restricted shrinking of the steel such as vents or voids in those parts of the mold subject to this compressive force.

All of the details of steel foundry practice mentioned so far pertain to those which commonly are considered before production of molds and cores begins. They exist as commonplace things in the average foundry making miscellaneous steel castings. In addition to them there are others of equal importance which must be studied for special designs of castings. They are not described here because the purpose of this article is to deal with some of the principal details considered by steel foundrymen before production actually commences.

Adventures of Bill

(*Concluded from page* 53)

windjammer, summed the situation rather neatly and concisely.

"'You a molder?' He said, eyeing me up and down as much as to say, 'What a transparent apology for a fakir you are.' He was partly justified. I weighed about 125 pounds, soaking wet and encased in two suits of fleece lined underwear. Foundries in those days were no tropical resorts in the winter time. I claimed that not only was I a molder, union card and everything, but that I was reckoned a very good molder, green sand, dry sand or loam. No side floor or dog house job for me. I performed only under the big hook.

"'I see,' says this snake in the bush. "Where wuz you workin' last?'

"I told him I had just concluded an engagement at the Fulton foundry in Cleveland.

"'Cleveland. Away out west, hey? That's one of them lake towns, ain't it, Michigan or Superior or something like that? How wuz business there when you left?'

"Without any suspicion of the trap he was setting for my unwary feet I spoke up innocently and bravely. When I left Cleveland business was rushing. Every shop was filled with work and every molder except the usual number of cards in and cards out and a few chronic bums was working full time, and in many instances over time.

"He inserted the point of a grimy fore finger under one side of a heavy, drooping, walrus moustache to expose a double row of very strong, very crooked and very yellow teeth. With the moustache at the proper elevation to clear the torrent, he spat about a gill, or possibly a gill and a half of very strong tobacco juice, Polar Bear brand, about 50 baume. Subconsciously I estimated that in the run of an ordinary day—no excitement of any kind—and the mastication of one standard size paper of Polar Bear, he wasted enough byproduct to blackwash the teeth of a 6-foot diameter gear wheel with a 10-inch face. He dropped the curtain back in place and then he mowed me down!

"'Rushing, hey?' says he. 'Then why the hell didn't you stay there?'

"Am I to understand," I asked, "that ever since that day you never have told the truth?"

"Well, no. I would not go that far in a statement. In the majority of instances I tell the truth, the whole truth and nothing but the truth. To smart alecks, nosey people, reporters and people who have no regard for the truth themselves I tell just as much as I think is good for 'em!"

Division of industrial hygiene, New York state department of labor, Albany, N. Y., has published a 70-page bulletin entitled, "Lead Poisoning in Industry and Its Prevention," by May R. Mayers and Minnie M. MaMahon. It is divided into five chapters which discuss sources of lead poisoning in industry, physiology of lead absorption and lead poisoning, diagnosis of lead absorption and lead poisoning, prevention of lead poisoning, and lead poisoning and compensation. Copies of the bulletin may be obtained for 45 cents.

Control Cupola Closely

(*Continued from page* 41)

Fig. 18 shows what grade of iron was obtained from this material.. Four tests taken during the day show that the chemical composition is rather consistent in each detail. The nickel pick-up is obtained by using high grade scrap steels from the machine shop. Average tensile strength of this iron is 38,000 pounds and the average result of the impact test is 22 foot pounds.

The transverse test bar is the standard bar 1.2-inch diameter and supported on centers 18 inches apart. After the transverse break is made, one half of the broken bar is placed in a centerless grinder and ground to 1.125 inches diameter. This part is placed on 6-inch supports on a Charpy type impact testing machine, having a capacity of 120 foot pounds.

One of the broken halves from the impact test is placed in a set of special dies and machined to the dimensions of the familiar standard tensile specimen. Cast iron briquets used in this particular operation are pressed by hydraulic pressure of 660,000 pounds, approximately 52,000 pounds per square inch on a 4-inch diameter surface. This makes a very fine cast iron brick approximately 81 per cent solid. A clearer picture is shown in Fig. 17. The column of borings shown on the right is entirely cast iron and shows the volume of borings used in making one briquet. That on the left is steel of the type gathered up and contains approximately 3½ per cent nickel steel. Steel borings present a much larger volume than cast iron. This accounts for the fact that the steel briquets made under the same conditions are only 70 per cent solid.

Melting loss in this material is not any more than in any other material used. Many times the bottom of the cupola has been dropped to ascertain the state of briquets. It has been gratifying to recover briquets melted to different degrees, showing that they do retain their shape at all times. The briquetting machine is shown in Fig. 8.

We have more or less established the fact that mechanical charging is very essential, especially when the type of material available is of the character that cannot be handled conveniently by hand.

Fig. 9 shows a view of the present material yard at the Caterpillar plant with equipment as it is now. Coke hoppers and limestone hoppers are in clear view, also two weighing pedestals connected with dials overhead on an approximate level with the crane operator in the moving cab. These dials are placed in a position readily observable to the operator. Another dial in the lower part of the picture is on the scale car for weighing coke and limestone. The scale car also acts as a transfer car from the weighing pedestal to the roller conveyor, for the buckets containing the iron charges. By this method the crane operator can unload cars, deposit the required amount into the weighing pedestal, and drop what he does not require to the ground. This as is readily apparent, has great possibilities in the cost of charging.

Operator Becomes Efficient

A closer view of the weighing pedestal is shown in Fig. 11 with the magnet directly overhead. With a little practice it is astonishing how efficient a crane operator becomes at dropping the required amount for making up charges. In releasing power the magnetism is not dissipated immediately and the material does not drop all at once. When some of it begins to drop off, the man watches the dial very closely and when sufficient drops off he immediately applies the power and retains the remainder on the magnet.

Fig. 12 shows a close view of the transfer scale car, for weighing coke and limestone. This type of bucket is not used for the metal charge.

Fig. 13 shows the buckets rolling to and from the hoisting well—the coke bucket on the right going to and the empty iron bucket on the left coming from the charging floor. The bucket for the iron charges holds 3000 pounds of metal, and in many cases the charges contain quite a large percentage of automobile cylinder blocks which are not broken up. This is the cone type bucket.

The coke and limestone bucket is the bottom drop type, hinged in such a manner that the materials flow out through the center. The reason for adopting this type of bucket for coke and limestone is that experience has found that when limestone gets too close to the cupola lining, deterioration of the lining is excessive. By using this type of bucket it is surprising how the limestone gets more or less toward the center.

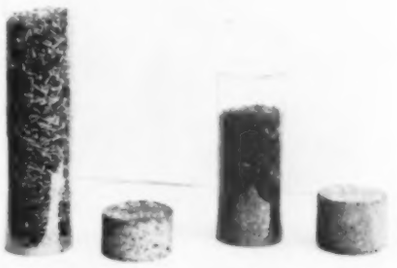

Fig. 17—Cylinder on left contains quantity of steel boring used in making adjacent briquet. Cylinder on right contains amount of cast iron borings used in making the briquet on far right

Fig. 14 shows the crane which lifts the charging buckets from the first floor, carries them into the cupola, deposits their contents and returns them to the rollers below where they are refilled. The operator is in position to supervise the hooking and unhooking of the bucket on the rollers which bring the buckets from the scale car. In many cases if the charge is not too

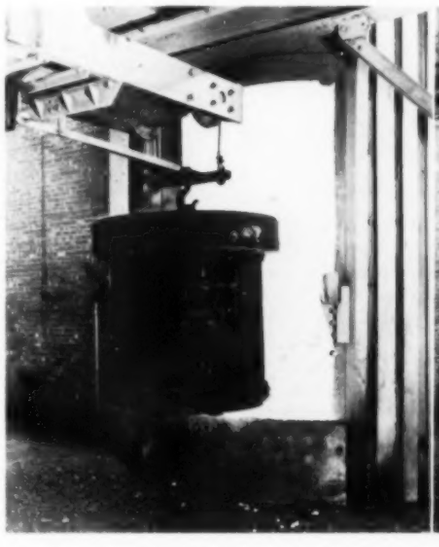

Fig. 15—Iron bucket just leaving cupola. Fig 16—Coke bucket entering cupola where it is set on wishbone, and its contents dumped

high he can hook and unhook the bucket by manipulation of the crane hook.

Fig. 15 shows the iron bucket just leaving the cupola after being emptied, while Fig. 16 shows the coke bucket entering the cupola where it is set on the wishbone and its contents dropped on the charge below.

Some mention should be made of the cost of delivering material into the cupola and the number of men required, bearing in mind the type of material used and that it is practically impossible to handle it by hand with any degree of safety.

what they are used for, also the chemical and physical results obtained. It may be interesting at this point to state that Caterpillar Tractor Co. does not believe in salvaging castings by the welding process.

The company tries to make a commodity and sell it as nearly perfect as humanly possible without resorting to salvaging processes. Salvaging of a little usually soon deteriorates into the salvaging of material in large amounts.

Fig. 10 shows a front view of the cupola, with its Caterpillar-built receiving ladles. This type ladle is similar to the one built many years

LABORATORY REPORT—FOUNDRY DIVISION

No. 3083

SAMPLE OF: 1E18

SYMBOL OR CAR INITIAL AND NUMBER:

PART NAME:

LOCATION ON CASTING SAMPLE TAKEN FROM:

DATE CAST: 6-9-32

LABORATORY DATES — RECEIVED: — REPORTED:

SOURCE OF SUPPLY:

	CHEMICAL ANALYSIS					PHYSICAL ANALYSIS		
	FURNACE	LABORATORY	CHECK					
CARBON—COMBUSTION	3.27		3.41	MOISTURE	3.39	TRANSVERSE STRENGTH LB.		3.31
CARBON—GRAPHITE				V. C. M.		DEFLECTION, INCHES		
CARBON—COMBINED				F. C.		BRINELL		
MANGANESE			55	ASH		SCLEROSCOPE		
PHOSPHORUS			.168	SULPHUR		DEPTH OF CHILL		
SULPHUR			129	ACID NO.		SHRINKAGE		
SILICON	2.45	2.46	2.46	2.48	SAP. NO. 250	2.25		2.42 2.30
NICKEL	.27	.22	.24	.27	IODINE NO. 33	.27		.24 .29
CHROMIUM					VIS.		GREEN STR. COMP.	
VANADIUM					SP. GR.		DRY STR. COMP.	
	3/16	1/8	5/32	5/32	5/32	5/32	DRY STR. TEN.	1/8 1/4

REMARKS: Avg - Tensile 38000# Impact 28 ft lbs

SIGNED: JWS

METALLURGIST

Fig. 18—Laboratory report giving data on grade of iron obtained from the material used in the metal charges

Four men are required for this job: One man on the outside crane making up the charges; one man on the transfer car weighing coke and limestone and manipulating the buckets at that point; one man on the charging floor crane for hoisting buckets and unloading the material into the cupola; and a supervisor on the charging floor whose duties are to add silicon or manganese briquets as the mixture may require, and other duties such as supervising the cupola on the charging floor. These four men handle as high as 250 tons in 8 hours. Cost of handling this material in the cupola is approximately 12 cents per ton. Cost of iron at the spout, which includes all materials and other accounting items, has been as low as less than 1 cent a pound.

Wages are paid on the day rate scale. There is no piece work, no bonuses or incentive systems in any division of the Caterpillar Tractor Co. The men work 8 hours per day, and are paid time and one half for overtime. This has been the policy of the company for many years.

A word now about cupola control, some of the several mixtures and ago, of small capacity but in general principles similar to the one illustrated with a capacity of 8 or 9 tons. It is insulated to the extent that the hand can be placed upon it without discomfort. It is lined with 2½-inch insulation brick and some 7 or 8-inch refractory. A ladle of this kind without insulation brick would register a temperature of approximately 300 degrees Fahr. 2 inches away from the shell.

The large funnel at the spout of the cupola is used for adding alloys directly into the stream. There is a small funnel adjacent to the cupola for adding carbon-raising material, ground amorphous graphite, which does not increase carbon as much as it does break down the chilling qualities of an iron. Experience has indicated that any more than 2 or 3 pounds of carbon-raising material added to a ton of iron is not necessary. Apparently there is a saturation point.

Controlling of a cupola to get a constant characteristic in metal requires close observance. In Fig. 3 one of the supervisors is shown reading the temperature of the metal with an optical pyrometer. These readings are taken at intervals of 15 minutes and their significance will be discussed later.

Will Hold Annual A.S.T.M. Meeting

Forty-first annual meeting of the American Society for Testing Materials will be held at Chalfonte-Haddon hall, Atlantic City, N. J., from June 27 to July 1. Approximately 100 technical papers will be presented at 18 formal sessions. The outstanding feature of the meeting will be a symposium on impact testing which is being developed jointly by the A. S. T. M. and the American Welding society.

The newly organized committee on radiographic testing is developing a series of papers covering pertinent topics in that field. Several interesting papers covering properties of metals as affected by temperature and fatigule are scheduled. One paper will discuss surface cracks on large 18 per cent chromium-8 per cent nickel, alloy steel castings.

In the field of cast iron technical contributions will be presented pertaining to effect of size and type of specimen on torsional properties, hardness measurement of vary hard chilled cast irons and hardened tool steels, and a paper on properties and uses of chilled iron. Annual reports of committee A-5 on corrosion of iron and steel, and committee B-3 on corrosion of nonferrous metals and alloys will include valuable data which have been developed in extensive research programs. An important paper will outline problems encountered in measuring thickness and weight of coatings on hot-dip galvanized castings and forgings.

Make Air Cleaners At Cleveland

Westinghouse Electric & Mfg. Co. has centralized the manufacture and sale of its precipitron at Cleveland. F. R. Kohnstamm, manager of the Cleveland division, which also produces all Westinghouse lighting equipment, will supervise activities in connection with the new air cleaning development. George F. Begoon, formerly with the Westinghouse new products division, East Pittsburgh, Pa., will be sales manager of the air cleaning division.

Pangborn Corp., Hagerstown, Md., has removed its New England offices to 175 State street, Springfield, Mass. J. H. Connolly, previously connected with the Detroit office, will be in charge.

HAUSFELD FURNACES

Make the best known Alloys With the cheapest known fuels

THE above Hausfeld Tilting Type Crucible furnace No. 625 is one of a battery in a foundry famous for the uniformly high quality of its non-ferrous alloys. Equipped with roller bearings and directly connected with city gas line with proportional mixers and zero governors, these furnaces effect substantial savings in production costs. Where natural or artificial gas is not available these furnaces burn fuel oil with equally satisfactory results.

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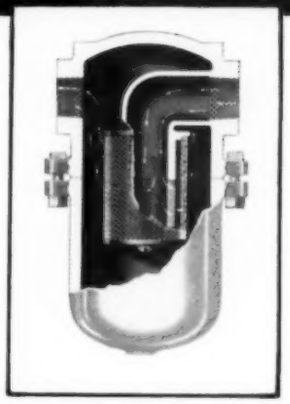
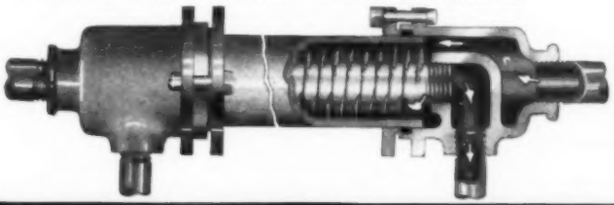


JOHNSON GAST separation devices do the vital job of removing condensation, dirt and oil from compressed air, and in the opinion of hundreds of users do it more thoroughly and dependably than any other equipment. The Gast Separator illustrated opposite, applies two tested principles of separation — expansion and change of direction. The air following the course of the arrows is deflected to the bottom of the inner chamber, meantime expanding. It then passes through many layers of coarse-mesh screen in which the wires are staggered to form a zig-zag passage — "a thousand baffles" on which the water, oil and foreign matter is deposited, ultimately draining out the bottom of the separator into a trap.

Where it is necessary to cool the air in order to condense the moisture or oil vapor, the Gast After-Cooler illustrated below does an excellent job. When air is used for paint spraying where the most minute trace of oil will not be tolerated, the Gast Oil Absorber is the completing step. Write for facts, capacities and installation suggestions.



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870 WOOD STREET **THREE RIVERS, MICH.**

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THAT'S a common question to the man who did it because only he can tell—you can't, your customer can't.

After a sand or blow hole is filled with Smooth-On No. 4, the surface trued up, and the filling allowed to metallize, even a trained eye and careful search cannot detect the spot.

In spite of all your precautions, some castings will come out of the mold with minor surface defects, which cause no weakness at vital spots but mar appearance. By correcting these blemishes with Smooth-On No. 4, you reclaim an astonishing tonnage, and make savings which should enable you to *safely* quote the successful price in competition.

Once you realize how easy Smooth-On No. 4 is to use and how well it does its work, you will never be without it.

Three grades offer a choice for perfect color, lustre and texture match on any iron or steel casting.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish.

Smooth-On No. 4A. For medium gray castings. A fine grained cement that has a good metallic lustre.

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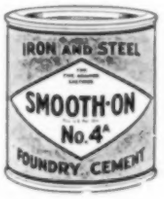
These compositions applied in the usual way meet ordinary needs, but modification of lustre and shade is easily obtained by rubbing the *dry* powder on top of the applied filling. This lightens the shade.



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Mail coupon for samples and prices. Smooth-On Nos. 4AA, 4A and 4B are packed in 1 lb. and 5 lb. cans, 25 lb. pails and 100 lb. kegs.

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Do it with SMOOTH-ON

NEW EQUIPMENT and SUPPLIES

Testing Equipment

Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, now is marketing two pieces of apparatus for rapid determination of carbon and sulphur in the laboratory. The carbon

Fig. 1—Apparatus for carbon determination is compact, and permits rapid and accurate results

determinator shown in Fig. 1 of the accompanying illustrations, consists of an oxygen purifying train, combustion furnace and volumetric train. The oxygen purifying train, securely mounted on a chromium plated bronze casting, removes all moisture, carbon and sulphur oxides from commercial oxygen, and also serves as an oxygen flow indicator.

The furnace is 9 inches long and 9 inches in diameter, and is mounted on chromium plated bronze castings. The shell is stainless steel and contains a port for inserting a thermocouple. The absorption train contains a special sulphur trap, a measuring burette with a graduated scale, a leveling bottle and carbon dioxide absorption bulb. It is claimed that accurate carbon determinations on ferrous and nonferrous materials may be made in 2 minutes with the apparatus.

The sulphur determinator shown in Fig. 2 of the accompanying illustrations consists of an oxygen purifying train, combustion furnace, preheater dust trap, and absorption train. The oxygen purifying train and furnace are similar to those previously described. Preheater dust trap is heated electrically. The sulphur determinator has a chromium plate base and support rod. The large, special burette is calibrated to indicate percentages of sulphur from zero to 0.400 per cent. Two automatic pipettes of 30 and 5 cubic centimeters also are mounted on the support rod, and are connected to the solution bottles. It is said that about 5 minutes exclusive of weighing time is all that is required to determine accurately the sulphur

Fig. 2—Sulphur in ferrous and nonferrous materials, and coal and coke can be determined quickly and accurately

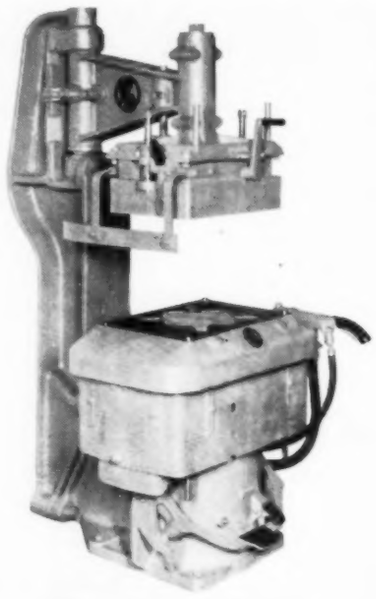
content of ferrous and nonferrous materials, coal and coke.

Molding Machine

Special design for what is claimed to be a new method of packing sand in molds, is incorporated in a molding machine recently developed by SPO Inc., East 61st street and Waterman avenue, Cleveland. Available in several sizes, one of the new machines is shown in the accompanying illustration. A larger machine provided with rollover mechanism is equipped to handle two parts of the mold, cope and drag side by side at the same time. The machine shown is equipped with a peening frame for a special job and strike bar which automatically levels sand on top of the mold when the squeezing head is swung to one side. This head is provided with a stop which comes in contact with the upper part of the main frame and thus locates the squeeze head accurately over the mold. The stop may be attached either on the right or left side of the machine.

The new and special feature of the machine is the table on which the pattern plate is mounted. Several vibrators under the table are set in motion after the flask has been filled with sand. Oscillating action set up by the vibrators produces a horizontal flow of sand in several directions and the resulting interlocking of the sand grains is said to produce a rammed mold of uniform density. A double lever shown at the right of the table controls both the vibrators and the

(*Continued on page* 120)



Vibrators under the table oscillate the sand in the flask while the head is squeezing the sand on top

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Jolt Cyl.	3"	4"	5"
Squeeze Cyl.	8½"	10"	13"
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Use TIECO foundry ladles and you use the best ladles that money will buy! *Made in all types and sizes* for more efficient, profitable foundry production. Day in and day out in foundries all over the country, TIECO foundry ladles are proving their worth. It will pay you to write today for descriptive literature.

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THE INDUSTRIAL EQUIPMENT CO.
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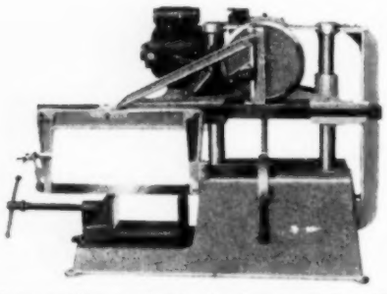
(*Continued from page* 118)
squeezing head. Each may be operated independently of the other, or they can be operated in unison. Through this combination the ramming process may be adjusted and controlled accurately to suit practically any type of casting within the capacity of the machine.

Through the combination of sand flowing horizontally while the head of the machine is squeezing the sand vertically, it is claimed the molder can ram undercuts effectively without any tucking by hand. The same combination holds in place either chills or ramup cores which may be necessary in making the mold. Oscillating action is claimed to produce a leveling effect on the sand in the flask and thus eliminates soft spots in some sections of the mold and hard spots over the high parts of the pattern. Combined effect of ramming the sand from beneath with the vibrators and from the top with the squeezing head results it is claimed in a ramming time of 15 seconds for each mold.

The machine, of rigid cast construction, is designed for long life. Brackets on the upper part of the main frame resist the strain when pressure is applied to the squeezing head. The pattern table is supported on springs, but sinks to a rigid bearing under pressure. After the mold is squeezed, a foot lever in front of the machine releases the pressure and the table sinks back to place while the mold is drawn from the pattern and supported on four pins, one at each corner. A special type of guide mechanism is designed to give perfect alignment of the pattern plate irrespective of whether the piston and plunger of the machine may be slightly out of line through wear.

Portable Hacksaw

Master Machine Co., 872 West North avenue, Chicago, recently has introduced a portable hacksaw machine. It is claimed that a new movement has been developed which automatically determines the exact pressure required to cut any degree of hardness in metals. No oil, grease or liquid is used at blade contact and it is said a high speed of operation is allowed without overheating of blade or stock.

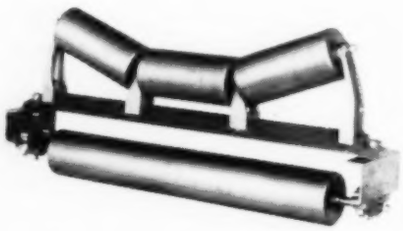


Cam action portable hacksaw with 125-pound gravity feed designed to prevent overloading

The unit is designed to provide uniform cutting movement with no vibration. The saw frame travels in 15 inches of bearing and is guided at top and bottom by a steel bar passing through a bronze fork, all of which allows more precise cutting. Chip interference is eliminated by the cam action of the saw and a 125-pound gravity feed is designed to prevent overloading. The machine is powered by either a one-half horsepower motor or by a gasoline engine.

Belt Idler

Jeffrey Mfg. Co., Columbus, O., has developed a new ball-bearing belt idler for carrying moderate loads of semi and nonabrasive materials. The idler is of the conventional 3-pulley, 20 degree troughing type, made for 14, 18, 20, 24, 30, and 36-inch belts. Its ball bearings are of the commercial type, with a cork seal within a pressed steel labyrinth dust cap. Pulleys are of 4-inch diameter welded steel pipe with formed steel gudgeons welded in the ends. These gudgeons are connected within the pulley by steel tubing which is said to prevent loss of grease into the pulley proper. Shafts are ¾-inch seamless tubing and are held by set screws within machine bored holes in the stands. As these shafts are hollow, the entire idler may be lubricated from either end through pressure fittings. Base angles are inverted to shed material.



Ball-bearing idler is of the conventional 3-pulley, 20 degree troughing type, made for 14 to 36-inch belts

Salt Dispenser

Morton Salt Co., Chicago, has developed a dispenser to provide a quick, economical and sanitary means of supplying salt tablets to workers. The device shown in the accompanying illustration is an attractive, polished, all metal cylinder fitted with a wall bracket for mounting at drinking fountains. Tablets are said to be kept dry and dust-free in the container until used. To secure a 10 or 15-grain salt tablet, a small lever at the base of the dispenser is flipped. Instructions for use of the tablets are engraved on a polished, 2-color plate on the face of the dispenser. A transparent slot directly below the instruction plate indicates when refilling is required. Refilling is accomplished without handling the tablets by removing top cover of the unit, and allowing the contents of a carton to discharge. Tablets for the container are packed in individual cartons containing 1500 ten-grain, or 1000 fifteen-grain tablets.

Dispenser for salt tablets is an all-metal cylinder designed to be mounted at drinking fountains, and to keep the tablets dry and dust-free

Respirator

Willson Products Inc., Reading, Pa., has developed a new respirator which is claimed to offer protection against type *A* dusts such as silica quartz, asbestos, aluminum, iron ores, etc., produced in the process of grinding, mining, quarrying and in the industrial operations of grinding, crushing and general processing of materials.

The manufacturer states the respirator is so designed that an effective filtering surface of more than 30

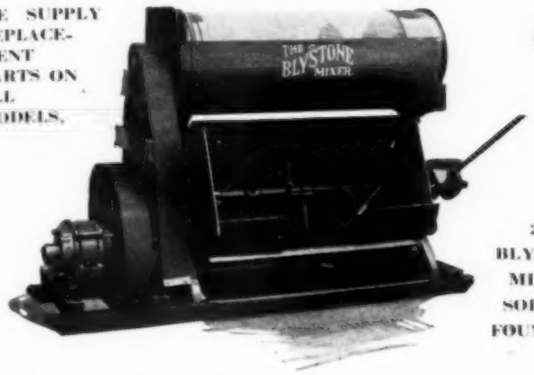
(*Continued on page* 122)

The effective filtering surface is confined in a relatively small area

For a Quick-Thorough Mix
use BLYSTONE

For over 25 years Blystone Mixers have been successfully used in Foundries for mixing core sand. There are two outstanding reasons why Blystone Mixers have done such a good job—(1) With the Blystone Patented Reverse Spiral Shovel System materials are mixed QUICKLY and THOROUGHLY; (2) Blystone

WE SUPPLY REPLACEMENT PARTS ON ALL MODELS.



2000 BLYSTONE MIXERS SOLD TO FOUNDRIES

Shovels DO NOT GRIND MATERIALS. It will pay to investigate the NEW models with many improved features; when making comparisons use the NEW models, not old ones. Do not confuse the Blystone SHOVEL type Mixer with paddle type Mixers.

Write for Literature

BLYSTONE MANUFACTURING CO.

638 Grant St. Cambridge Springs, Penn.

SPECIMEN POLISHING AT L-O-W SPEEDS . . .

AB

•Recent findings in research bring to view specific advantages in polishing metallographic specimens at low speeds. The A-B Low Speed Polisher shown above meets the requirements of those who want these advantages in this phase of specimen preparation. It is a highly efficient and sturdily built equipment and embodies desirable use-conveniences.

The 1938 "METAL ANALYST" having many NEW items is in preparation. Shall we reserve a copy for you?

CUTTERS AND GRINDERS
STRAIGHT LINE GRINDERS
PAPER DISC GRINDERS
HIGH SPEED POLISHERS
SPECIMEN MOUNT PRESSES
TRANSOPTIC MOUNTINGS
SPECIMEN STORAGE CABINETS
POLISHING STANDS
MICROSCOPES OF EVERY DESCRIPTION

Adolph I. Buehler
OPTICAL INSTRUMENTS • METALLURGICAL APPARATUS
228 NORTH LA SALLE ST. • • CHICAGO ILL.

Modern IMPROVEMENTS IN Heroult ELECTRIC FURNACES

TYPE 1½ *Heroult Electric Furnace showing floor tilting, copper tubing, and wedge type electrode holders.*

FOUR major innovations make Heroult Electric Furnaces more efficient than ever —

Floor attached to shell tilts with furnace.

Water-cooled copper tubing, with suitable separation from mast arms, carries current to electrodes to prevent hysteresis and eddy current losses.

Improved wedge type electrode holders.

Lightweight welded roof coolers.

Heroult Electric Furnaces have gained a remarkable reputation for efficient melting and refining of all kinds of ferrous materials by basic or acid process—including alloy, tool and forging steels, iron and steel castings. Any capacity from ½ ton to 100 tons; removable roof, chute, machine or hand charging.

AMERICAN BRIDGE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.
Baltimore Boston Chicago Cincinnati Cleveland Denver
Detroit Duluth Minneapolis New York Philadelphia St. Louis

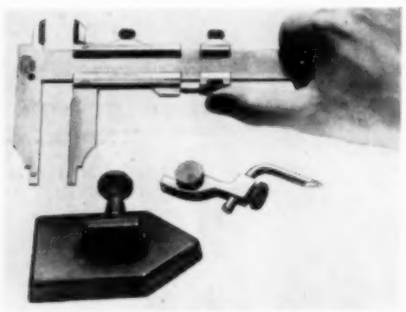
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

(*Continued from page* 120)
square inches is confined in a relatively small area. It may be cleaned by the introduction of a jet of compressed air into the core. A metal cover cap protects the filter from contact with the wearers hands, keeping it clean of surface dirt, grease, and oil. Spectacles or safety goggles can be worn with this respirator. All parts are replaceable.

Caliper High Tool

George Scherr Co., 128 LaFayette street, New York, has developed a caliper with height gage combination. The caliper is graduated in



Caliper may be transformed into height tool when attached to base by a screw and tapered center

1/1000 and 1/128 of an inch and is made in three sizes with measuring capacities of 7, 9, and 11 inches. A base is supplied which, if attached by a screw and a tapered center at the end of one jaw, transforms the caliper into a height gage.

The base is heavier and larger in area so that the height gage will rest firmly on the surface plate without possibility of tilting. The caliper also has two knife edges which are useful for layout work, for measuring distances between holes and for determining root diameter of gears. The scribing attachment is a separate unit and may be attached firmly to the upper jaw.

Portable Pyrometer

Bristol Co., Waterbury, Conn., has added another portable recording pyrometer to its line of instruments. It is claimed the new instrument is rugged and not affected by vibration. It has no continuously moving parts or trains of gears to become engaged and released to position the pen. Mechanical motion only occurs with a change in temperature at the thermocouple. Connection between the galvanometer and five separate units which compose the pyrometer is electrical only. The instruments are available as pyrometers for ranges from 0 to 500, and 0 to 3000 degrees Fahr., and as resistance thermometers for ranges from 20 to 350 degrees Fahr. The chart on the instrument is 12 inches in diameter, and rotation is by an electric clock.

Scale Truck

Barrett-Cravens Co., 3255 West Thirtieth street, Chicago, has developed a new line of beam and dial scale trucks. The combination of scale and lift-truck unit is said to give lift-truck users the advantages of a scale in production and handling of materials. The addition of the scale to the truck permits weighing, counting and measuring of materials by the weight method. Design of the trucks permits their installation for use with any type of skid having a minimum clearance of 7½ inches.

Scale levers of beam scales are mounted in vertical steel frames away from dust and dirt. They have been allowed liberal working clearances, and have been so designed that they are always in full view at eye height. Other features of the scales are: Full capacity chromium plated weigh beams, open face poises, shock absorbing platform check bars fitted with double shielded ball bearings. Beam scales are of

Scale truck permits weighing or counting of materials by the weight method

3500 and 5000 pounds capacity. For light duty materials handling and weighing, the company also manufactures dial scale trucks of 2500 pounds capacity.

Coal Crusher

A new two-roll spring-relief coal crusher has been developed by the Link-Belt Co., 307 North Michigan avenue, Chicago. Standard sizes include crushers with rolls of 26-inch, 30-inch and 36-inch diameter. Large capacity with limited degradation, inherent in two-roll crushers, and the adjustability of single-roll crushers, are said to be combined in this one unit.

Cut tooth wheels and link roller chain are used to form the driving connection to both rolls from the crusher countershaft. Roll shafts are carried in heavy rigid bearings, with one shaft adjustable to vary the size of product or to compensate for wear. Adjusting sleeves are provided with relief springs as a protection against excessive stresses. Rolls are of the segmental type, having cast iron spiders to which are bolted heavy alloy iron segments, heat treated to a brinell hardness of from 500 to 600. These segments may be removed without removing the side housing.

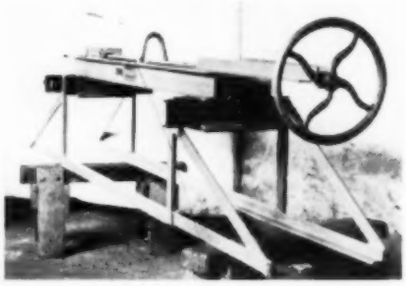
Welding Electrodes

Harnischfeger Corp., Milwaukee, has introduced a welding electrode designed for welding on parts subject to heavy impact such as manganese castings, railroad frogs and crossings, dipper teeth, etc. Its base metal is nickel steel, ranging from 11 to 14 per cent manganese and 3½ to 4½ per cent nickel. Carbon content is in excess of one per cent.

These electrodes as well as all other electrodes manufactured by the Harnischfeger Corp. are packed in hermetically sealed metal containers designed to prevent damaging absorption of moisture by sodium silicate present in the electrode as a binder.

Mold Lifter

J-B Engineering Sales Co., New Haven, Conn., recently has developed a special device shown in the accompanying illustration for handling groups of small molds. It is suspended by the loop shown on top, from the hook of any suitable crane or hoist. By turning the hand wheel in one direction, the legs move apart to straddle the line of flasks. The wheel then is turned in the opposite direction and the long angle irons move in under the edges of the molds. The unit then may be lifted for transportation.



Long angle-iron legs are moved either in or out by the hand wheel

FEATURED AT THE "SHOW"

KIRK & BLUM

Dust Collecting Systems

At the right is the Kirk & Blum exhibit, A.F.A. Show, Cleveland.

In the rear is shown a portion of the Kirk & Blum piping erected for one of the major exhibitors who had a large amount of equipment in operation.

It is significant that this Kirk & Blum piping system was preferred to all local and other installations.

THE KIRK & BLUM MFG. CO., 2808 Spring Grove Ave., Cincinnati, O.

PYRO THE SIMPLIFIED OPTICAL PYROMETER

You cannot afford NOT to own one!

■ Because it eliminates guesswork, waste and spoilage; it pays for itself quickly.

■ More than 40% of adults have defective vision. Why "guess" when you can KNOW EXACTLY so easily and so inexpensively?

■ PYRO is a self-contained, DIRECT reading, sturdy unit made to stand rough foundry use but it is absolutely accurate and dependable. It requires no correction charts, no accessories, no upkeep. Foundrymen swear by it because PYRO is made for **foundry use.**

■ PYRO is STANDARD with all leading and progressive foundries throughout the country.

Write or our new catalog No. 80

For non-ferrous foundries use

"PYRO IMMERSION PYROMETER"

The Pyrometer Instrument Co.
106 Lafayette St. New York, N. Y.

HELLO, AGAIN, FELLAS! *I'm the guy who was "on the corner" at the foundry show... Our barrel of Radiant Perfect Wash (still running strong) certainly drew the crowds. This is the original dip suspension blacking you can use by brushing, swabbing or dipping. Write for a free working sample.* - *Bill Sagger*

We Manufacture

Seacoals, 10 different grinds.

Core Compounds, Plumbagos, Blackings, Core Washes . . in grades for every purpose.

Parting Compounds: Tripoli, Non-Silica, Liquid.

Core Paste, Paste Binder, Dust On Facing, Special Facings and Compounds to fit any job.

We Distribute

Glutrin Goulac Purite
"Volclay" Wyoming Bentonite
Soapstones Silica Flour

LEADERS FOR 59 YEARS..

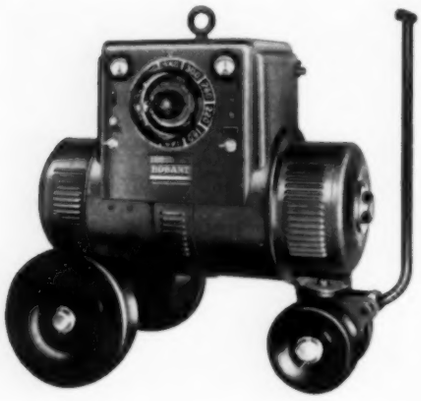
The Smith Facing & Supply Co.

1857 Carter Rd., Cleveland, Ohio

RADIANT FACINGS Since 1879

Arc Welders

Hobart Bros. Co., Troy, O., recently announced a new line of arc welders in which the welding range of each machine is divided into ten



Ten range arc welder with a 100-step, continuously wound rheostat operating in each range

ranges with a 100-step, continuously wound rheostat operating in each range. The result is said to be a complete absence of "dead spots" and closer control of the relationship between open circuit voltage and welding current.

Remote control is retained and only an ordinary lamp cord extension is needed to place the rheostat within reach of the operator. These arc welders are made with 100-600 ampere ratings with electric motors and with 200-600 ampere ratings with gasoline engine drives.

Floor Truck

A frame of special design with double side girders which hold the hardwood top firmly in place without bolts is a feature pointed out by the Lewis-Shephard Co., 245 Walnut street, Watertown, Mass., for its new floor truck. Castors are hung on steel arch sections in such a way, it is claimed, that more kick space is allowed the operator. Wheels operate on roller bearings and are available in metal, solid rubber or pneumatic tires. Capacities are from 1000 to 4000 pounds.

Vacuum Tube Timer

General Electric Co., Schenectady, N. Y., has developed a new general purpose vacuum-tube timer for application to industrial machinery, particularly machine tools, which require a definite time delay during operation. Electronic portion of the new device consists of a three-element, high-vacuum metal tube which may be replaced through any radio supply store. The timer is arranged to operate on either 115 or 230 volts, and 50 or 60 cycles.

Contact tips are rated one ampere at 115 volts and 0.5 ampere at 230 volts. The timer is calibrated with a scale having ten divisions proportional to time. The maximum and minimum operating times on 115 volts are approximately 60 seconds and 3 seconds. The resetting time is about 5 seconds for 100 per cent timing.

Dome Light

Benjamin Electric Mfg. Co., Des Plaines, Ill., has developed a dome-lighting combination unit utilizing an arrangement of three 150-200 watt lamps around a central mercury lamp of 400 watts which is said to produce a blended light that may be used during the day as well as at night. The lamp, which is shown in the accompanying illustration, has a ventilated reflector of porcelain enameled steel. An opal glass cylinder surrounds the lower portion of the mercury lamp. In the

Dome lighting combination unit employs tungsten and mercury lamps

event of momentary current failure the incandescent lamps supply stand by illumination during the short interval necessary for the mercury to cool and restart.

Welding Hose

New York Belting & Packing Co., Passaic, N. J., has developed a welding hose which is constructed of an oxygen and acetylene resisting rubber tube covered with two or three plies, according to the size, of strong lightweight duck. Over these duck plies is braided the safety ply of high tensile asbestos yarn which prevents hot sparks and metals from penetrating the hose.

Pattern Plates

George F. Pettinos Inc., 1206 Locust street, Philadelphia, now is marketing magnesium alloy pattern plates which are claimed to be light and strong. They are said to be inexpensive, durable, less fatiguing to the worker, and sandblasted to eliminate a too-smooth mold joint. The plates possess excellent machinability characteristics which provides a fine smooth finish without tendency to drag, tear or chip out.

Electric Saw

Electric trim saw has been added to the line of portable electric tools of Van Dorn Electric Tool Co., Towson, Md. This saw weighs 11¼ pounds and gives a maximum vertical cut of 1⅜ inches. Speed with no load is 4200 revolutions per minute and 2800 revolutions per minute at full speed.

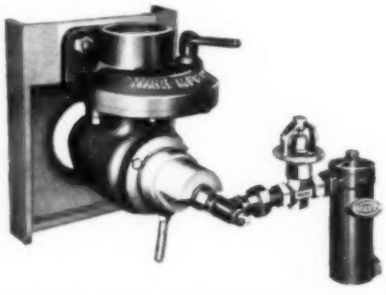
Polarity Control

New polarity control scheme announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., energizes the field of the welder from a separate source comprising a small transformer and rectox unit. This unit excites the field just strongly enough to control the residual magnetism and consumes 25 to 100 watts. It is claimed that this scheme not only eliminates the heavy-current reversing switch but also guarantees against reversal of polarity.

Oil Burners

Mahr Mfg. Co., division of Diamond Iron Works Inc., Minneapolis, recently has announced a new line of low pressure atomizing oil burners claimed to be designed ruggedly to withstand severe service in industrial heating operations. Simple oil clogging is removed through a pipe plug on tee located directly in front of the oil stem. Removal of three cap screws and the oil connection loosens the entire atomizer for cleaning.

Air is controlled by a lever handle on the internal unit and the oil supply is controlled by a regulating valve. Each burner is equipped with a large fine mesh strainer. These same oil burners also may be used for burning high pressure gas by installing the gas line in place of the oil line.



Oil burner for industrial heating also may be used with gas

SCIENTIFIC
Pressure Cast
MATCH PLATES
For those who were not able to attend the Foundrymen's Exhibition in Cleveland, we have prepared a folder that explains in detail the savings in time and pattern cost, in addition to the increased foundry production, made possible by the use of Scientific, Pressure Cast, Match Plates. • Send for your copy and see how easy it is to produce smooth, accurate castings the "Scientific" way.

THE SCIENTIFIC CAST PRODUCTS CORP.

FORMERLY A DIVISION OF ART IN BRONZE CO., INC.

1388 • 1392 EAST 40TH STREET • CLEVELAND, OHIO

ONLY ABOUT

1/4 THE COST

OF ORDINARY FLASKS

One WOOD'S PEERLESS TAPER SLIP FLASK plus seven adjustable Pouring Jackets equal the output of from *seventy-five to one-hundred-and-fifty* ordinary flasks.

And—you save approximately seventy-five cents on every dollar you invest in flask equipment when you specify WOOD'S PEERLESS TAPER SLIP FLASKS!

Every motion of the molder counts. More castings can be made in each mold. More molds can be placed in a given space. Accurate, quality castings are assured.

These are advantages tried and proven . . . offered you by a maker of more than 80 years' reputation . . . fully described in Catalog 371 which will be sent you, without obligation, upon request on your business letterhead.

HOW IT WORKS

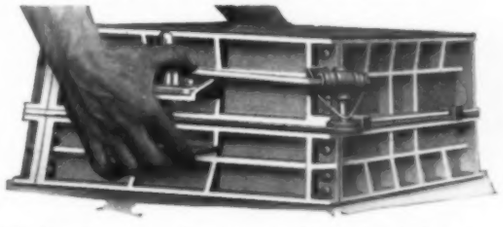


Illustration above shows the operator gripping the pin brackets on drag preparatory to lifting the complete flask off the mold.

It will be observed that the molder's thumb has depressed the sand strip lever and by so doing the sand strips have been withdrawn from sand back flush with inside walls of flask.

As soon as operator removes his thumbs the positive acting spring and lever arrangement automatically causes the sand strips to assume their proper positions to hold sand in flask.

Obviously, there is no wasted time or lost effort . . . production is speeded (with decreased labor costs) wherever Peerless Tapered Slip Flasks are used.

T. B. WOOD'S SONS CO.

CHAMBERSBURG, PA.

50 Church St., New York City 387-391 Atlantic Ave., Boston

OAS

ENGINEERING SERVICE

Well rounded organization of *technical and practical foundry engineers*, and architects completely equipped to handle any problems in designing, building or operating a foundry.

Specializing in planning, and equipping new plants, redesigning existing plants, and advising on methods of decreasing costs and increasing production.

O. D. CONOVER

Consulting Engineer

MAIN 8772

1740 East 12th St. Cleveland, Ohio

FOUNDRY ACTIVITIES

RECENTLY organized Gallipolis Stove & Foundry Co., Spruce and Second streets, Athens, O., is acquiring several carloads of new equipment in anticipation of fall demands.

* * *

Hagerstown Bronze & Aluminum Co. Inc., Hagerstown, Md., has been dissolved and the general foundry and machine services will be conducted by the Kauffman Mfg. & Supply Co. The company will produce gray iron and nonferrous castings.

* * *

Foran Foundry & Mfg. Co., Flemington, N. J., recently was damaged by fire. Loss was estimated at $20,000. According to John F. Schenk, mayor of Flemington and vice president of the company, the damage disrupted only a part of the plant and that operations will continue.

* * *

Charles R. McGraw will build a brass foundry at 514 West State street, Long Beach, Calif., at a cost of approximately $5000.

* * *

American Brake Shoe & Foundry Co., 2001 Laurens street, Baltimore, is planning shop improvements to cost approximately $40,000.

* * *

Motor Castings Co., 1111 South Sixty-fifth street, Milwaukee, is planning the addition of a fire-proof core oven enclosure to its foundry.

* * *

Board of regents, Washington State college, Pullman, Wash., took bids May 27 for reconstructing the foundry building and altering the mechanical engineering building.

* * *

Jefferson Metal Cast Co., Jefferson, O., is being organized by William Akerholm and F. J. Mann to specialize in the manufacture of metal toys and other metal novelties.

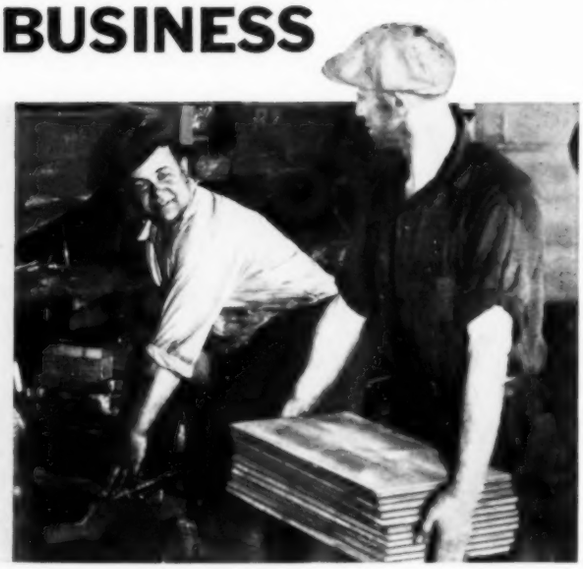
* * *

Index of foundry equipment orders for April, according to a report of the Foundry Equipment Manu-

(*Concluded on page* 128)

They must be good...

80% OF ALL TRANSITE CORE PLATE SALES ARE REPEAT BUSINESS



LIGHT WEIGHT of J-M Transite Core Plates cuts labor costs. Here, a worker is carrying eleven ½" Transite Plates. An equal number of metal plates would be about four times the weight of these, over 450 lbs., an impossible load for a single trip.

OF the 76,400 Transite Core Plates in service today, more than 80% were purchased as repeat orders! And the reason is simple. Wherever they have been used they have stepped up production; made real savings in operating, maintenance and handling costs.

Remarkably light in weight . . . only about one-quarter as heavy as metal plates of equal thickness . . . Transite Core Plates speed up operations. Coremakers actually can carry twice as many plates with considerably less effort. This fact alone results in a large saving of time and a substantial increase in production capacity . . . with lower handling costs.

Made of a specially treated asbestos-cement composition, Transite Core Plates are exceptionally strong and durable. Being non-metallic, they offer unusual resistance to corrosion. And, since warping is practically impossible, these plates are good for many years of efficient service . . . provide large operating and maintenance savings.

You'll convince yourself of the many advantages of J-M Transite Core Plates in very short order by making a test installation in your own foundry. For complete details, write Johns-Manville, 22 East 40th Street, New York, New York.

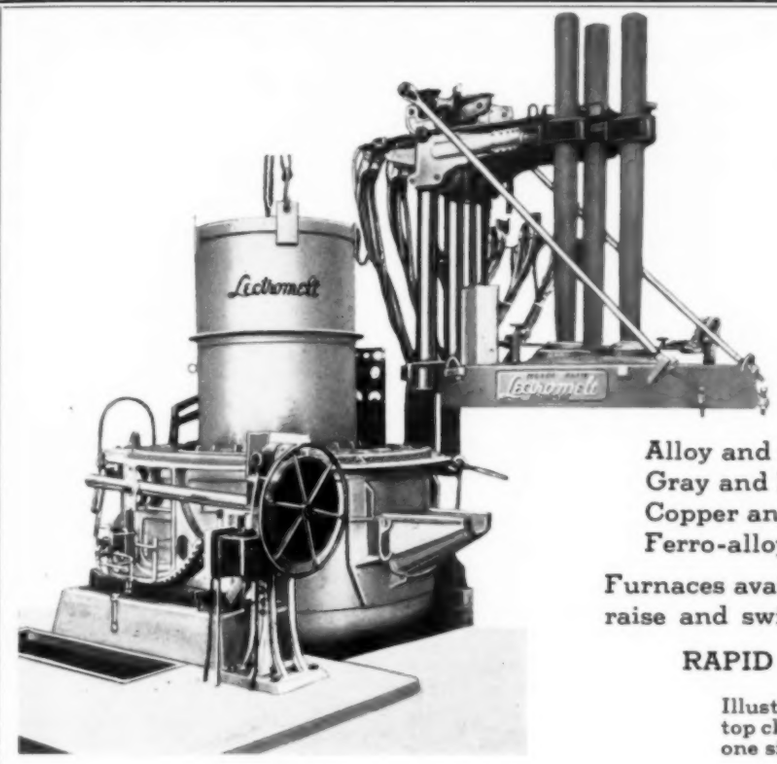
JM Johns-Manville

TRANSITE CORE PLATES

RAW MATERIAL PRICES

June 1, 1938

Iron	
No. 2 foundry, Valley	$24.00
No. 2 Southern Birmingham	20.00
No. 2 foundry, Chicago	24.00
No. 2 foundry, Buffalo	24.00
Basic, Buffalo	23.00
Basic, Valley	23.50
Malleable, Chicago	24.00
Malleable, Buffalo	24.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$ 5.75 to $ 6.25
Wise county beehive coke	5.50 to 6.50
Detroit by-product delivered	11.10
Scrap	
Heavy melting steel, Valley	$11.00 to $11.50
Heavy melting steel, Pitts. (div.)	11.00 to 11.25
Heavy melting steel, Chicago	10.25 to 10.75
Stove plate, Buffalo	10.50 to 11.00
Stove plate, Chicago	7.50 to 8.00
No. 1 cast, New York	9.50 to 10.00
No. 1 cast, mchy., Chicago	10.50 to 11.00
No. 1 cast, Pittsburgh	13.00 to 13.50
No. 1 cast, Philadelphia	14.50 to 15.00
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	12.50 to 13.00
Car wheels, iron, Chicago	11.50 to 12.00
Railroad malleable, Chicago	11.25 to 11.75
Malleable, Buffalo	12.00 to 12.50
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	8.52½
Straits tin	36.75
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	14.25 to 14.75
Lead, New York	4.00
Antimony, New York	11.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.00



MOORE RAPID

Lectromelt

FURNACES

for

MELTING
REFINING
SMELTING

Alloy and Carbon steels
Gray and Malleable irons
Copper and Nickel and Alloys
Ferro-alloys, Carbide, and Special products

Furnaces available in top-charge type with quick raise and swing roof—also in door-charge types.

RAPID - ECONOMICAL - RUGGED

Illustration shows new LECTROMELT top charge furnace with roof rotated to one side and charging bucket in place.

PITTSBURGH LECTROMELT FURNACE CORP.

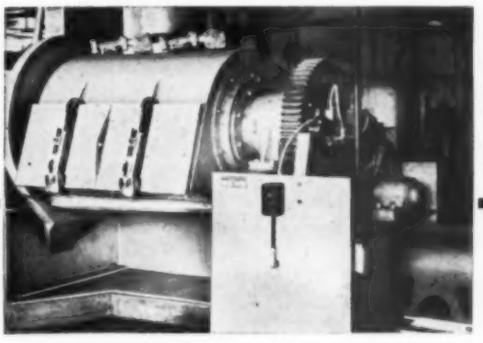
P. O. BOX 1257 PITTSBURGH, PA.

The sun always shines when you use Steelblast Abrasives in your cleaning.

Because there are no dust clouds to obscure the vision, you will get better results with lower cleaning cost. Steelblast Abrasives are tougher, sharper, faster, and safer. Give it consideration.

May we send our abrasive engineer?

STEELBLAST ABRASIVES CO.
6538 CARNEGIE AVE. CLEVELAND, OHIO



Get the Finest Grit-Blasted Finish with the Parsons Direct Pressure Oscillating Blast Barrel

You can use four nozzles, thanks to Parsons' oscillating motion. Clean a full load quickly, smoothly, evenly. Compressed air means negligible maintenance. Better work—more work—lower cost. One prominent foundry has installed four units within the past two years. Detailed bulletin mailed upon request.

PARSONS ENGINEERING CORPORATION
3599 EAST 82nd ST. • CLEVELAND, OHIO

PARSONS

(*Concluded from page* 126)

facturers' association, Cleveland, was 79.3 as compared with 114.6 in March and 208.1 in April of last year. Index of shipments was 93.4 as compared with 99.4 in March and 232.5 in April, 1937.

* * *

Production of gray iron and steel castings in the Philadelphia Federal Reserve district decreased slightly during April, following a 1-month rise. Gray iron output decreased 1.5 per cent but steel castings production, with a decline of 8.5 per cent, continued the drop of preceding months although at a much slower rate.

NEW TRADE PUBLICATIONS

Copies of any of the literature listed below may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

SAND MIXERS—National Engineering Co., 549 West Washington boulevard, Chicago, has published a bulletin covering nine sizes of the Simpson intensive mixer. The book also describes complete auxiliary equipment for proper sand reclamation, sand conditioning, sand control, sand and mold handling equipment, and the design and manufacture of sand machinery. The bulletin is published on the twenty-fifth anniversary of the National Engineering Co.

CLAY PRODUCTS—Folder recently issued by the Illinois Clay Products Co., Joliet, Ill., describes fire clay brick, flour, bond and other clay products produced by the company.

ELECTRIC TRUCKS — Elwell-Parker Electric Co., 4205 St. Clair avenue, Cleveland, recently issued bulletins No. A-8328 and A-8329 which describe and illustrate the uses for new electric tiering fork and high lift platform trucks.

COMPRESSORS—Revised edition of bulletin A-12-A recently has been published by the Sullivan Machinery Co., Michigan City, Ind. The bulletin describes single-stage horizontal compressors and new dual cushion valves.

CONTACTOR CONTROLLER—Yale & Towne Mfg. Co., Philadelphia division, Philadelphia, has issued a folder describing and illustrating a new cam-operated contactor controller used on electric trucks.

EYE SAFETY — Safety engineering division, American Optical Co., Southbridge, Mass., has published a chart which specifies types of safety goggles for wear in all principal industries. It classifies eye hazardous operations by industries and recommends specific types of eye protection equipment which have been developed for each hazard.

CHAIN HOISTS — McCollum Hoist & Mfg. Co., Downers Grove, Ill., has issued a 4-page leaflet which contains a price list of its line of ball bearing spur geared hand chain hoists. A complete parts list also is included. Another bulletin, No. 101, recently published by the company, illustrates and describes the construction and operation of hook and trolley type electric hoists.

HOISTS AND CYLINDERS — Hanna Engineering Works, 1765 Elston avenue, Chicago, has issued catalog 226 which lists its complete line of air cylinders and gives dimensions and capacities of the equipment. The catalog is illustrated with pictures and cross section drawings. It also includes descriptions of valves and gages for the equipment.

METALLOGRAPHIC EQUIPMENT — Bausch & Lomb Optical Co., Rochester, N. Y., has published catalog E-225 which lists and describes its metallographic equipment for metallurgical laboratories. The booklet includes many illustrations and a complete price list. Metalloscopes, microscopes, lenses, illuminators, and eyepieces are among the pieces of equipment included.

MERCURY LIGHTING — Westinghouse Electric & Mfg. Co., Lighting division, Cleveland, has issued a folder illustrating applications of high intensity mercury vapor lighting in industrial plants. It illustrates the complete line of equipment and accessories manufactured by the company for both mercury and combination mercury-incandescent units.

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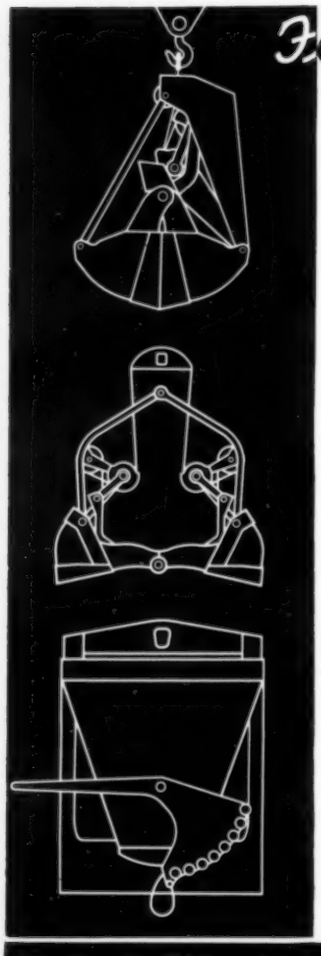

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